HOW TO: 10 EASY Steps to Quality Cowls

48120

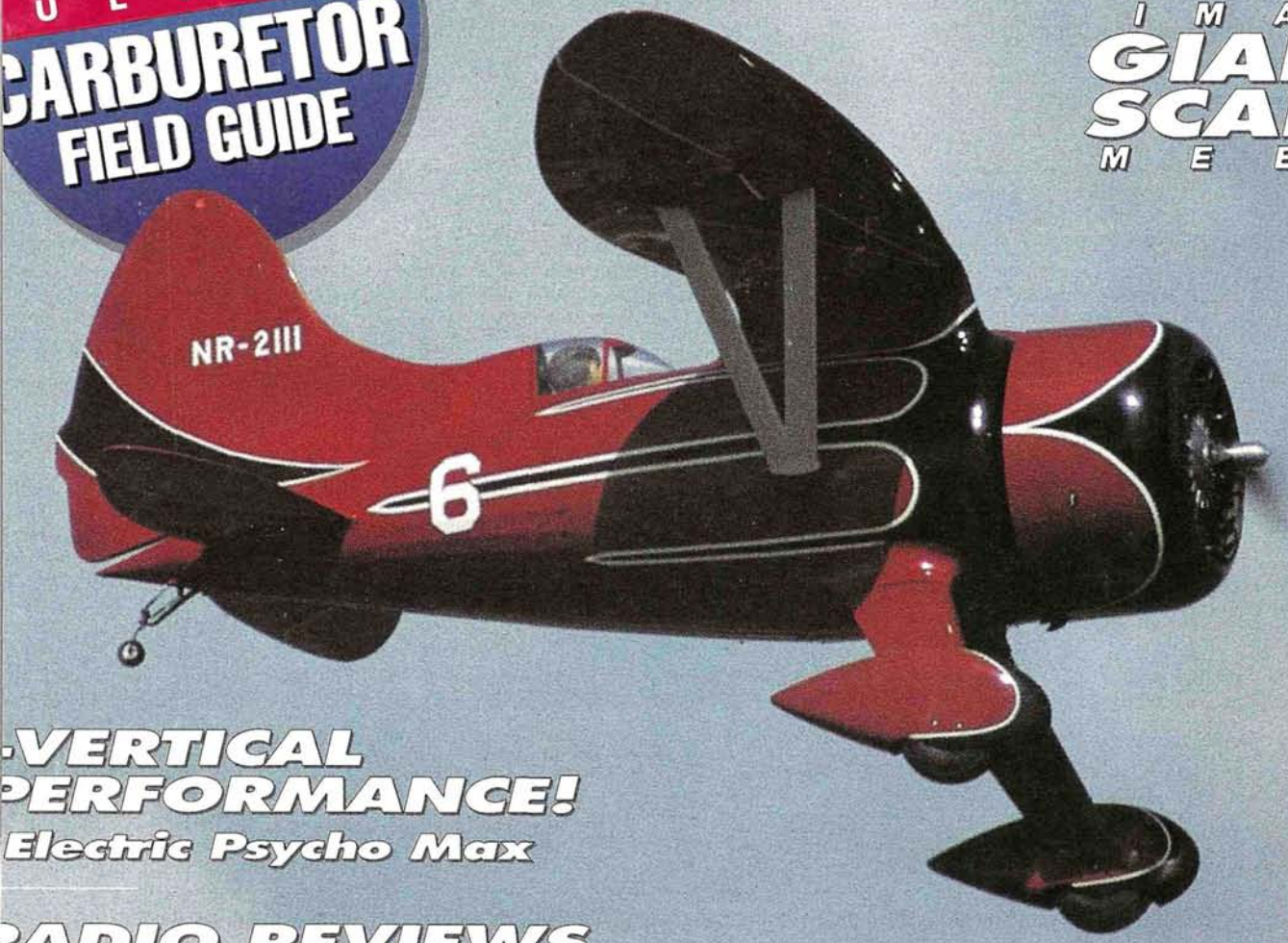
November 1991

MODEL AIRPLANE NEWS

WORLD'S PREMIER R/C MODELING MAGAZINE

FREE PULLOUT CARBURETOR FIELD GUIDE

IMAA GIANT SCALE MEET



VERTICAL PERFORMANCE!
Electric Psycho Max

RADIO REVIEWS
MicroPro 8000
-User Friendly
Kyosho 6FM-H
-Entry-level heli

Scale Weathering Secrets

MID-COLUMBIA SLOPE RACE
Fastest gliders in the world!

$2.95 Canada $3.75

11

71896 48120

NOVEMBER 1991 VOLUME 119, NUMBER 11

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

ON THE COVER: *center—built from Don Neill plans, Lee Moore's Hall Bulldog wows the crowds at the 1991 IMAA Rally of Giants. Upper right—sample cowl by Vernon Williams illustrates a fiberglass building technique that reliably produces factory-quality cowls. Lower right—action at the 1991 Mid-Columbia Slope Race.*

FEATURES

14 AstroFlight Zero-Loss Connectors
by John Rist
A Bench Review
—A new, electric-flight connector is tested

36 1991 Mid-Columbia Slope Race
by Wil Byers
—World's fastest gliders!

42 Design for Flaps, Part Two
by Andy Lennon
—How to build slotted flaps

48 1991 IMAA Rally of Giants
by Dan Parsons
—Big birds in Texas

54 Setting Up Your Model With the Ace Micropro 8000
by Gerry Yarrish
—How to use this advanced, user-friendly radio

61 Great Planes P-51D Mustang
by George Jenkins
A Field & Bench Review
—A new sport-scale version joins the ranks

69 Model/Tronics Psycho Max
by David Baron
A Field & Bench Review
—Electric flight with vertical performance!

Special 8-page pullout:
CARBURETOR BASICS

74 10 Steps to a Fiberglass Cowl
by Vernon Williams
—Make one-off factory-quality fiberglass cowls

77 Products to Extend Your Flying Time
by Michael Lachowski
A Field & Bench Review
—SR External Battery Pack and the Ace DMVC

HELICOPTER SECTION

93 Contents

94 Rotary-Wing Roundup
—New heli products

96 Helicopter Challenge
by Craig Hath
—Mastering inverted flight

99 Radio Review: Kyosho Series 91 Advance 6FM-H
by Paul Tradelius
—A great choice for beginner and intermediate heli pilots

CONSTRUCTION

29 Fred's Special
by Vernon Williams
—"The way an electric ought to fly"

COLUMNS

12 Fifty Years Ago
by Gerry Yarrish
—More three-views

16 Air Scoop
by Chris Chianelli
—"I spy for those who fly"

COLUMNS

19 Building Model Airplanes
by Joe Wagner

22 How To: Make a Square Battery-Pack Jig
by Randy Randolph

80 Sporty Scale Techniques
by Frank Tiano
—Weathering techniques

84 Golden Age of Radio Control
by Hal deBolt

88 Quiet Flight
by John Lupperger

112 About Those Engines
by Joe Wagner

DEPARTMENTS

6 Editorial

8 Airwaves

24 Pilot Projects

115 Buyers' Mart

130 Product News

132 Club of the Month

134 Name that Plane

138 Ad Index

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**,251 Danbury Rd., Wilton, CT 06897. Second-class postage paid at Wilton, CT, and at additional mailing offices. Subscription rates are: $24.95 for 1 year (foreign, $34.95); $45.95 for 2 years (foreign $65.95). **Postmaster:** send Form 3597 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

EDITORIAL

by TOM ATWOOD

WE HOPE you enjoy this issue's free, pullout booklet on the basics of carburetor set-up and operation. Bob Gilbert, an engineer with many years of R/C flying, spells out what you need to know to run the basic types of glow-engine carb successfully. We plan to publish more of these booklets; if you'd like to see some specific topics covered, let us know, and we'll add them to our list.

In July, on a vacation in southern Arizona, I had a chance to investigate the flight performance of electrics in desert conditions. I've heard it said that the "density-altitude" in this region makes electric flight marginal. Are the "nay-sayers" working from an outdated stereotype? In the photo, I'm flying a slightly modified Graupner Uhu in high humidity (monsoon season) at an altitude of more than 3,000 feet, in Catalina, which is a community in the foothills near Tucson.

The temperature at 11 a.m. was 95 degrees Fahrenheit. The Uhu climbed to several hundred feet without any difficulty and in a matter of seconds. In the photo, I was flying close-in passes at low altitude to give fellow modeler Dan Goodyear a chance to catch the action on film. Each pass required only a few seconds of power to gain enough altitude for the next flyby. The plane had power to spare—and this is the earlier Uhu, which has a higher wing loading and a wingspan that's 6 inches shorter than the current version. My modified Uhu is powered by seven, SR "cut sub-C" 1000 Max cells and propelled by an AstroFlight FAI .05 Cobalt motor spinning a Sonic Tronic 11x7 folding prop. It also carries a pair of Graupner spoilers.

Earlier that morning, I flew a modified Carl Goldberg Electra sailplane in desert thermals that just wouldn't quit (extended wingspan, D-tube construction to the dihedral joint, geared Astro Cobalt .05 motor, Master Airscrew 12x8 folding prop). Two hawks accommodated the plane in their formation, and I finally had to fly it inverted to prevent it from disappearing out of sight.

Completed *Model Airplane News* questionnaires are pouring in, and we thank you for providing information that will help us improve the magazine. Wondering what your fellow modelers are most interested in seeing coverage of? We'll give you a summary when the data is in. ■

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

Group Publisher	LOUIS V. DeFRANCESCO JR.
Publisher	DR. LOUIS V. DeFRANCESCO
Associate Publisher	YVONNE M. MICIK
Editor-in-Chief	TOM ATWOOD
Associate Editors	CHRIS CHIANELLI GERRY YARRISH
Copy Director	LYNNE SEWELL
Copy Editors	KATHERINE TOLLIVER LAURA KIDDER
Assistant Copy Editors	DEBORAH S. CARROLL KAREN JEFFCOAT
Art Director	ALAN J. PALERMO
Associate Art Director	MARY LOU RAMOS
Assistant Art Directors	BETTY KOMARNICKI JONATHAN T. KLEIN MATTHEW J. LONGLEY
Art Assistants	STEPHANIE L. WARZECHA ALLYSON NICKOWITZ
Promotional Artist	ROBIN DEMOUGEOT
Staff Photographer	YAMIL SUED
Systems Manager	ED SCHENK
Systems Assistants	SALLY WILLIAMS WILLIAM MACK STEPHEN TRAUTLEIN
Director of Marketing	GARY DOLZALL
Circulation Manager	KATHLEEN RHODES
Production Coordinator	MARY M. REID
Advertising Account Executive	JULIA K. PEMBERTON
Advertising Account Representative	MICHAEL S. STANKIEWICZ
Advertising Traffic Assistant	KYRA MATERASSO
Advertising Coordinator	SHARON WARNER

SUBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): 1 year (12 issues), $24.95; 2 years (24 issues), $45.95. Outside U.S.: 1 year, $34.95; 2 years, $65.95. Payment must be in U.S. funds.

SUBSCRIPTION INQUIRIES: call 1-800-435-0715.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut. Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. Micik, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by a SASE will be returned.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: (203) 834-2900. FAX: (203) 762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

PRINTED IN THE U.S.A

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the writer's identity can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

MODELING DOWN UNDER

I read your magazine every month, as do many other members of our club. As the editor of the Tingalpa Model Aeroclub in Brisbane, Australia, I'd like to contact other clubs in the States that might be interested in exchanging monthly club magazines. The Tingalpa Club is the largest in Australia, boasting over 245 members. We have an excellent flying field and, owing to our friendly weather, members can fly most days of the year. I hope to hear from secretaries or presidents of clubs so that we may exchange ideas.

I. K. GILLESPIE
7 Sidney St.
Fairfield
Brisbane, Queensland
Australia 4103

Mr. Gillespie, we want to encourage communication among aeromodelers around the world (greater contact can only help advance the state of the art) so we'll pass the word on to our readers. Let us know of any exciting projects your club members are working on! TA

ROYAL TREATMENT

I'm a glider pilot and general aviation enthusiast who recently entered the world of R/C aircraft. I found your excellent magazine about two-and-a-half years ago. It provides me with a lot of general knowledge about model aviation.

Recently, I took delivery of my first airplane, the Great Planes Spectra. As this model nears completion, my thoughts have already wandered to the future, where gas looms ominously. With my new-found experience in airplane building, I'd like to move on to something that's a

little more complicated and in scale. Royal has quite a large selection. I don't know much about their products, however. Could you publish a construction article on one of these beauties?

JARED MALARSKY
N. Andover, MA

Jared, thanks for the comments regarding the magazine. Last issue, you'll be pleased to see our review of the GP Spectra sailplane. We've witnessed a high degree of satisfaction among modelers who have Royal kits. I built their B-25, KI-43 Oscar, their .60- to .80-size Mustang and the Corsair. All fly well. As a beginner, you might find the kits a little complicated. They're traditional wooden kits, and there's a lot of sanding, planking and forming—the basic ingredients for beautiful stand-off-scale planes. Watch for reviews of new Royal products in these pages—including their upcoming P-61 Black Widow. Their full product line was included in our Model Airplane News 1991 "Buyers' Guide." Good luck! CC

JETLINER LOVER

Help! I'm 18 years old, and I've been flying a lot of my high- and low-wing model airplanes. Over the weekend, I was flying my Cessna 172. While I was flying, I saw two things in the sky: my Cessna 172 and a commercial jetliner Boeing 747 coming in for a landing a couple of miles away. I landed my model, and I saw a D-10 coming in for a landing. I'd like to find a model of a commercial airliner, e.g., a 747, a D-10, or a 727. Where can I find information about these models and their engines? Can you help me?

AZHAR ABDALLAH
College Point, NY

Azhar, on your way to acquiring your jumbo jet certification, I strongly suggest that you stay in a holding pattern until you have many advanced trainers and sport planes under your belt. A large jumbo jet would indeed be an impressive model, but it wouldn't be very practical. (You wouldn't fly it every Saturday off a grass runway!) You'd need a large paved runway and, moreover, you'd have to power it with three or four ducted fans. Very expensive! Building the model would be very complex as well, and you'd need a large, well-equipped workshop. As you progress

(Continued on page 10)

AIRWAVES

(Continued from page 9)

through the hobby, maybe one day you'll develop, build and fly your own airbus. It doesn't hurt to dream! As for info on models and model engines, Air Age Publishing has several excellent books on basic and advanced modeling, control linkages and model engines. Just check out our Buyers' Mart for the books you'd like to read. GY

MINIATURE R/C ASSIST

This is to let you know that I appreciate your construction articles, especially on mini models—electric especially. I'd like to do "R/C assist" of small (24-inch) electric free-flight models (rudder-only stuff), probably using 27MHz (old) equipment. Sure, there's a risk of interference, but it's still practical in many parts of the country. Besides, this risk is balanced against the loss of my models in thermals. I've lost two HiLine Min E planes so far. Both had unlit dethermalizers (only "test" flights of 20-second power duration). Are such radio systems available?

GEORGE PEARCE
Chesapeake, VA

George, we're working on some construction articles of the type you're asking for, so stay tuned. Cox Hobbies sells a small, inexpensive single-channel radio that uses 27MHz that's designed for miniature, rudder-only aircraft. You can reach Cox at 350 W Rincon St., Corona, CA 91720; (714) 278-1282. TA

PROPS AND POWERPLANTS

I have an O.S. .35 engine. Please recommend a proper three-blade prop size for it. Also, is it possible for any engine to rotate clockwise *and* counterclockwise? I guess some 1/2A engines can do that; how about bigger engines?

NAMSOO PARK
Seoul, Korea

Park, the O.S. .35 has old-style loop-scavenge porting and, though it's very reliable, it's quite mild in terms of power, so you must take care not to "over-prop" and, thus, overheat it. Graupner's 8x6 three-blade prop should be fine, but their 9x7 might be too much. If you can find a 9x5 or a 9x6, these sizes would be worth a try, too. To figure out which size of three-blade prop you need, subtract an inch from the diameter of the two-blade prop you've been using or, better yet, reduce pitch by 1 inch, and then choose a three-blade prop. That will get you in the general ballpark from which you can start to work.

To get an engine to run clockwise (the opposite of what's usual), you have to change to a special crankshaft, which can sometimes be purchased from the engine's manufacturer. You see, in a front-intake engine (like most of today's R/C engines), the gases are inducted through the front by means of a hollow passage in the crankshaft that then leads the gases into the crankcase and, ultimately, up into the combustion chamber. Cut into the shaft, there's a window, or port, that has to start allowing gases from the carburetor into this hollow passage, at some point before top dead center. It follows that the direction of rotation is a major consideration when cutting this port, because before top dead center, induction is essential. If you look at a 2-stroke crankshaft from the front, you'll see that the center of this port doesn't line up with the shaft and the crankpin's center lines when they're aligned; it will be

(Continued on page 109)

FIFTY YEARS AGO

BOMBER WATCHDOG AND MORE THREE-VIEWS

by GERRY YARRISH

THE COVER of the November 1941 issue of *Model Airplane News* shows a twin-tailed German aircraft (probably an Me 110) being blown to bits by the fire of an ascending twin-engine British bomber/fighter. The flames' glow is reflected on the skin of the aircraft and gives it a look of strength and superiority. The plane is the powerful-looking Bristol Beaufighter, and *Model Airplane News* called it the "Bomber Watchdog."

The Beaufighter's crew consisted of a pilot and a rear gunner. It had a single tail, and its wing-mounted engine nacelles were set ahead of the fuselage's stubby nose. It had a wingspan of 57 feet, 10 inches and was 41 feet, 4 inches long, 15 feet, 10 inches high, and it weighed 14,069 pounds. Powered by two Bristol Hercules XI 14-cylinder radial engines (each rated at 1590hp), its top speed at 15,000 feet was 323mph, and its rate of climb was 1850 feet per minute. It had four fixed 20mm cannons in its nose, six fixed .303 machine guns (three in each wing) and a flexible mounted .303 gun in the upper aft blister. With so much fire power, it's little wonder that the Bomber Watchdog was able to eliminate its foes.

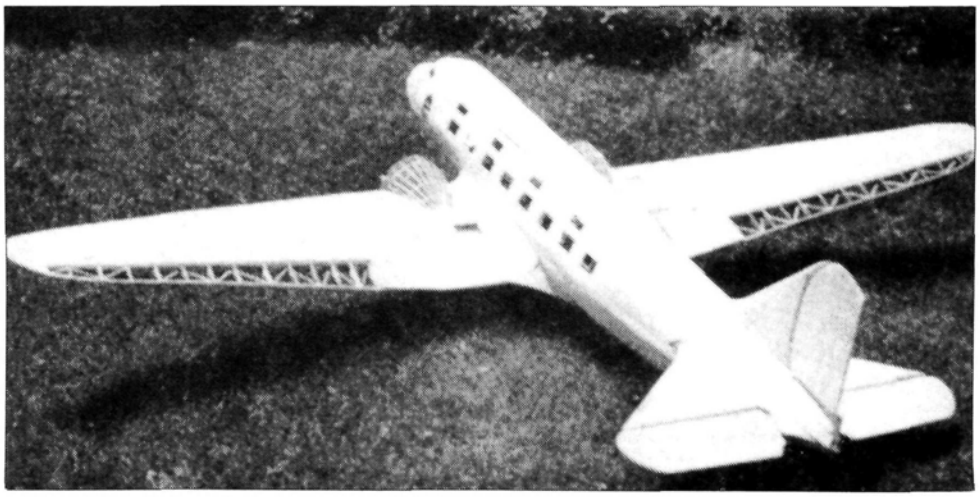
GAS LINES

The main focus of the opening pages of "Gas Lines" was that even 10 years after its initial proposal, the government still hadn't started a program to oversee the development of model aviation education. With war demands requiring 30,000 new aircraft each year, did the government expect to grab skilled workers, engineers and pilots out of thin air? The building blocks of a strong future in aviation were the young, but the government was ignoring their importance; it was actually reducing its support. *Model Airplane News* suggested that modelers send postcards to their representatives in Congress. It also suggested that clubs should invite them to their fields for some first-hand experience. Even today, with the loss of so many flying fields, that's a pretty good idea.

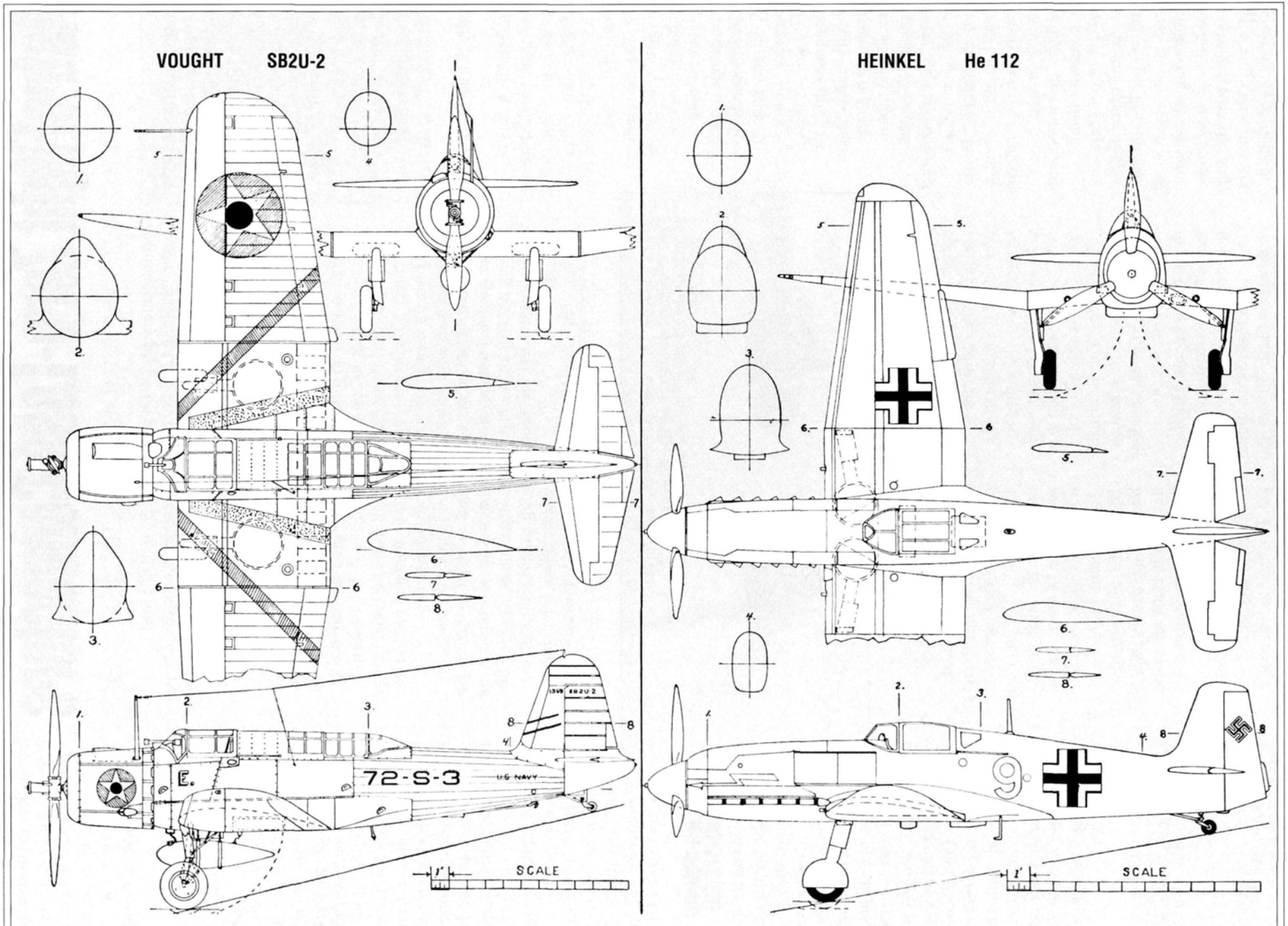
One of the most interesting contests held that year was the fifth annual event put on by the Exchange Gas Model Club of Denver, CO. *Model Airplane News*' coverage of the event reflected the wide variety of models that flew in all classes, including Giant Gas Scale. Private Charles E. Englerth from Chanute Field, IL, showed up with a beautiful, almost completed DC-3 that weighed a mere 10 pounds. It had a 9-foot wingspan, and its owner planned to power it with two Brown engines. Its final finish was to be .003-inch aluminum foil over 1/32-inch balsa sheeting—a beautiful model, even by today's standards.

MORE THREE-VIEWS

Like all the early issues of *Model Airplane News*, the November '41 issue contained an excellent collection of three-views to fire the imagination of its readers. Two examples were the Vought SB2U-2 Vindicator (the company's first low-wing monoplane), which was designed as a carrier-based scout/bomber, and the Heinkel He 112—a German single-seat fighter that was powered by a 1,150hp Daimler-Benz D.B. 601 engine. Perhaps these interesting three-views will inspire you to build your own versions. ■



Though this DC-3 was built 50 years ago, it looks as if it could compete in some of today's giant-scale competitions. It's a big, beautiful bird!


VOUGHT SB2U-2
72-S-3
SCALE
HEINKEL He 112
SCALE

AstroFlight Zero-Loss Connectors

A new winner in the connector wars

Electric-flight enthusiasts who strive for the best possible performance will be interested in AstroFlight's new Zero-Loss connectors. This review is reprinted from the October '91 issue of Radio Control Car Action, a sister publication that's dedicated to R/C car enthusiasts.

by JOHN RIST

THERE'S A NEW contender for the title of "best connector." Connectors' features have always been a tradeoff between performance and convenience. The convenience of having connectors on your battery packs is obvious every time you want to change a battery pack in 30 seconds or less. That they reduce performance is understood by serious racers, who eliminate this loss by directly connecting (hard wiring) both the battery and the motor.

In my last "Connector Inspector" article (published in Jan '91 issue of *Car Action*), the Sermos* Power Pole and Litespeed* connectors easily won the connector war, but since then, AstroFlight* has introduced a new connector that it claims has zero voltage loss and is capable of handling a true 100 amps. The throttle jammers among you who've been following my tests during the last year or so know that when you pass 100 amps through connectors, they get hot, most will melt, and all the shrink-wrap will be burnt off the battery packs. I headed to the "Scoping Out" lab to heap connector-inspector abuse on the Zero-Loss Racing Connectors.

ZERO LOSS?

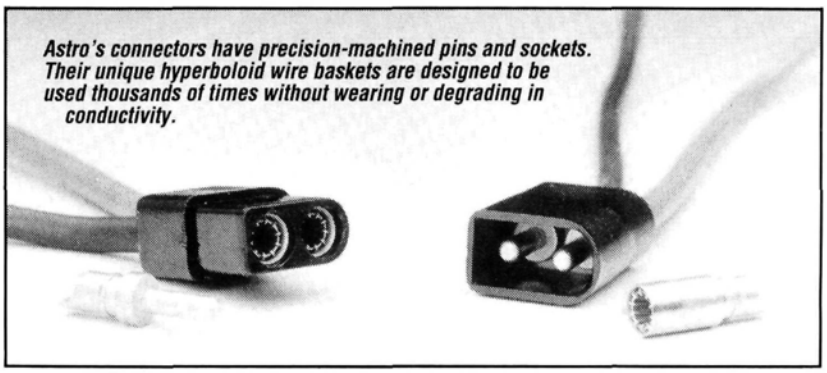
I first wanted to test AstroFlight's claim about zero voltage loss. To do this, I connected a 2.5-foot-long piece of 13-gauge monster wire (Stage III* Super 13) into the setup that I use for measuring speed-controller resistance. I then put two needle probes on the wire, 2 feet apart and took a voltage reading between them. The current for this test was set at 12 amps.

The voltage drop turned out to be 0.055 volt, which is a resistance of 0.00458 ohm (voltage divided by current equals resistance). I soldered one set of the connector's contacts to the middle of the monster wire. The voltage drop along the 2 feet of wire with the contact installed was 0.056 volt—a resistance of 0.00466 ohm. This is virtually no difference! Also take into consideration that this reading is liable to error because the last digit on any digital measuring device has an uncertainty of ± one count. This means that when a digital voltmeter reads 0.056 volt, the voltage in question might be 0.057 or 0.055 volt. Nevertheless, it was obvious that this is very close to being a zero-loss connector.

100A CAPACITY?

AstroFlight also claimed a true 100A capacity for this connector. To run the 100A test, I installed both sets of contacts in the connector's shell using the usual monster wire—the one I used in the resistance test.

I looped the connector back on itself so that the current would flow through one of the contacts, through the loop and back through the other contact. I then put a Litespeed connector (to mate with my battery pack) on the remaining loose ends of the monster wire. When I connected the Zero-Loss connectors across the battery pack, the current jumped to 119 amps. At 20 seconds, it dropped to 80 amps; at 40 seconds, to 68 amps; and at 60 seconds, there were 24 amps of current flowing. During this, the covering burnt off my battery pack and the wires became too hot to handle, but the Zero-Loss connector stayed cool—clearly, one good connector! In fact, it's the best connector that I've ever tested, so it's definitely the connector king.



Astro's connectors have precision-machined pins and sockets. Their unique hyperboloid wire baskets are designed to be used thousands of times without wearing or degrading in conductivity.

BUT WAIT!... THERE'S MORE!

When you've installed it properly on its wires, it's impossible to connect the Zero-Loss connector backward. (Remember that the number-one destroyer of speed controllers is a "reverse-connected" battery pack.)

...ANY BAD NEWS?

This connector's only drawback is its price—a suggested retail of $9.95 for a pair. To make matters worse, you can't put both of the halves that come in the package on a battery pack because the male and female halves of the connectors are completely different, so the connectors cost $9.95 for each battery. Of course, the other one in the pair goes on your speed controllers and battery chargers, but if you have six to 10 battery packs, equipping them could be expensive. (AstroFlight's Bob Boucher says that the halves are available individually: $2.99 for the male half; $6.99 for the female half.)

A KING AMONG CONNECTORS!

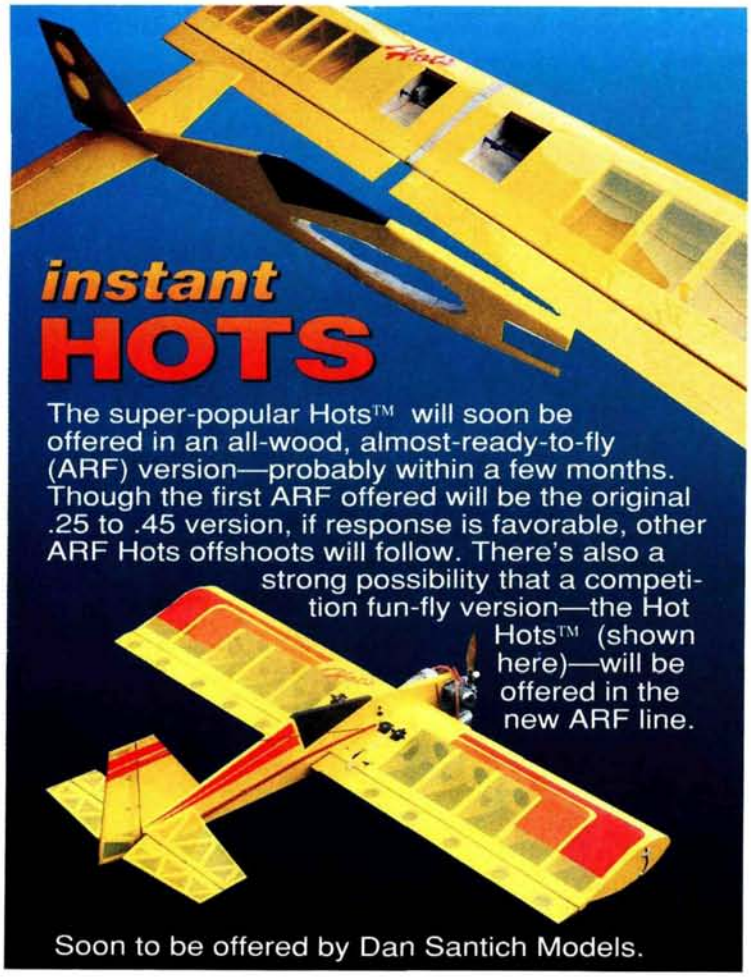
So there you have it! —a new winner in the connector wars. If you're involved with high-voltage airplanes, heavy truck-pulling, or high-voltage boats, all of which have high current requirements, and you want quick-change battery capability, the Zero-Loss Racing Connectors will definitely work, and work well. They eliminate the need to decide between performance and convenience: with the Zero-Loss Racing Connectors, you can have both.

**Here are the addresses of the companies mentioned in this article:*
Sermos R/C Snap Connectors, *Cedar Corners Station, P.O. Box 16787, Stamford, CT 06905.*
Litespeed, *P.O. Box 4765, Spokane, WA 99202.*
AstroFlight, *13311 Beach Ave., Marina Del Rey, CA 90292.*
Stage III, *1189 Chicago Rd., Troy, MI 48083.* ■

AIR SCOOP

by CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!



instant HOTS

The super-popular Hots™ will soon be offered in an all-wood, almost-ready-to-fly (ARF) version—probably within a few months. Though the first ARF offered will be the original .25 to .45 version, if response is favorable, other ARF Hots offshoots will follow. There's also a strong possibility that a competition fun-fly version—the Hot Hots™ (shown here)—will be offered in the new ARF line.

Soon to be offered by Dan Santich Models.

HELI CARD

SCI's line of high-quality speed controllers, which are manufactured in Austria and well-known by R/C car enthusiasts, will soon include a unit that's specifically designed for electric helicopters. There's an important difference between controllers made for R/C cars and those made for helicopters. The battery-eliminator circuitry (BEC) in a helicopter's speed controller must be able to handle more voltage. The Heli-Card has a heavy-duty BEC, and its high-voltage Megafets can handle 1200 amps peak current and 320 amps continuous. I've been to the SCI factory in Vienna, so I can tell you that SCI uses the latest technology to manufacture its high-quality speed controllers.

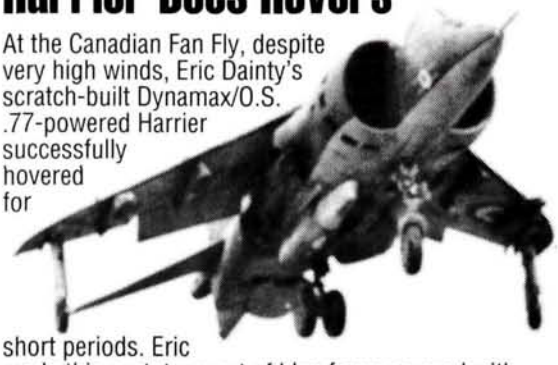
2 New LANIER

While Lanier RC of Oakwood, GA, has been busy working on built-up kits like the superfine 1/4-scale Stinger, which was reviewed in the October '91 issue of *Model Airplane News*, the company hasn't forgotten its line of plastic ARF kits. Pictured here are the new TR-260 and the Fun Fly 40. The 60-inch-span TR-260, which calls for a .60 2-stroke or a .90 4-stroke, is designed for aerobatic performance. New vacu-formed parts, e.g., the cowl, give the TR-260 a more scale-like appearance than the older Lanier Lazer. The .19- to .46-powered Fun Fly 40 has a 48-inch span and 518 square inches of thick airfoil area for great slow-flight characteristics. The TR-260 has typical Lanier construction, while the Fun Fly 40 is mostly ARF, except for the balsa tail feathers, which must be covered. Both kits use the proven Lanier airfoils that have made the company's name synonymous with good flight performance.

F4U fun

Joining the ranks of the Midwest Fun-Scale™ fleet will be this .40-size Chance Vought Corsair. Like the rest of Midwest's warbird fleet, the Corsair is of all-wood construction, and weight and simplicity of assembly were major design prerequisites.

Harrier Does Hovers



At the Canadian Fan Fly, despite very high winds, Eric Dainty's scratch-built Dynamax/O.S. .77-powered Harrier successfully hovered for short periods. Eric made this prototype out of blue foam covered with fiberglass cloth. The vectoring nozzles haven't yet been completed, so when Eric tried to hover the Harrier for more than three or four seconds, the high winds got the better of it—as you can see in the photos. Next year, Eric plans to have all vectoring nozzles fully operational, so he should be able to make the transition from hover to forward flight.

COLOR PHOTOS BY TONY NUNEZ

TELEMASTERING MANHATTAN

By the time you read this, Angelo Lanci and his "Manhattan-Flight Project" team will have attempted to fly their Zenoah 23-powered, modified Hobby Lobby Senior Telemaster around Manhattan Island. After two years of preparation, the Telemaster was to take off from a disused pier somewhere on the Brooklyn waterfront and then circle the Big Apple. How long would all this take?—estimates said 95 minutes.

The intended flight path was entirely over water, and the plane would fly *under*, not over, all the bridges (and since some of the smaller ones are only 25 feet high, they'd be major obstacles!). The model would be followed by two "chase" boats with monitoring and communications equipment.

The project is sponsored by Futaba, which has supplied two top-of-the-line PCM sets that will reduce the "interference factor." Of course, Hobby Lobby supplied the Senior Telemaster, which, after much experimentation, Angelo concluded was the most suitable commercially available kit for this venture. I'm writing this shortly before flight day, so I have no info about the project's success or failure, but *Model Airplane News* will deliver complete coverage on the attempt, from the specialized technical aspects to the final—we hope, dry!—touchdown.

BUILDING

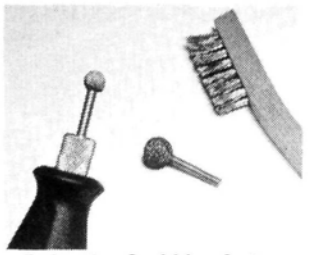
MODEL AIRPLANES

by JOE WAGNER

More ways than one to drill a hole

ONE OF THE MOST common tasks involved in model-building is making holes in parts. This seems so elementary that, to most modelers, it probably doesn't seem worthy of discussion; yet there's a lot more to this job than just clamping a bit into the chuck of an electric drill and holding the trigger while you push the spinning bit through the material in which you want a hole.

For one thing, a "1/4-inch" drill motor is probably almost the worst tool to use for modeling. It's meant for carpentry, not precise drilling. There are far better tools available to us: drill presses, Dremel Moto-Tools and hand-operated drill holders of several types.



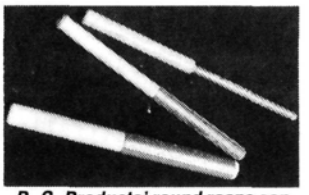
Robart's Carbide Cutters teamed with a Dremel Moto-Tool are incredibly versatile for shaping wood. The wire brush quickly cleans clogged cutters.

Small enough to work inside most R/C model fuselages, Dremel's MiniMite has ample power for most modeling jobs, and it can be fully recharged in cnly three hours.

You can find inexpensive Taiwanese drill presses in home-improvement stores. A few years ago, by shopping around at the right time, I found a big, industrial-quality, floor-model drill press for only $175. Its massive column and heavy-duty spindle ensure rigidity and freedom from vibration for high-precision projects such as model-engine reworks. A cheaper, smaller, bench-type press is, however, perfectly capable of doing most of the drilling jobs that modelers need to do.

To support model parts while I drill them, I don't use my press's circular cast-iron "table." I've found it much better to top that with a clamped-on 3/4-inch hardwood board, which gives clean, non-skid support. It also allows me to drill through model parts without damaging the metal table.

Always keep in mind that drill bits are cutting tools and that their edges must be sharp, correctly angled and symmetrical. If they aren't, the bit will wobble, cut oversize holes, "burn" its way through, or do something else that's undesirable. Dull drills can be resharpened, but doing that job *correctly* requires the use of specialized grinding equipment that only professional machine shops can afford. The "home workshop" drill sharpeners I've seen are probably OK for carpentry-grade drills, but *not* for anything more precise.



D. G. Products' round rasps contain tungsten-carbide abrasives and will never wear out in model-building applications. They're great for enlarging holes, and they're equally good for shaping fillets.

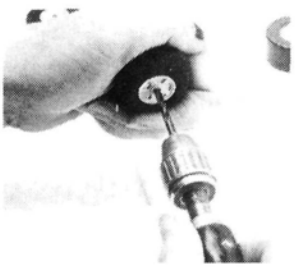
DULL DRILL?

When your drill point dulls, the easiest solution is a new bit. The modeling sizes aren't expensive. Ace R/C sells them (including 6-inch and 12-inch lengths)—even hex-shank bits that fit cordless powered screwdrivers. Dremel Moto-Tools have been modelers' mainstays ever since they first came out many years ago. The high rpm on the "fixed-speed" models can, however, cause burning and "loading up" during sanding and routing operations and when drilling plastics. Variable-speed Dremels are better. Set the speed as low as you can for the job at hand. Only grinding operations need high rpm; drilling and sanding are better done at slow speeds.

When completing R/C airplanes, I particularly like to use Dremel's two-speed, battery-powered MiniMite for those inevitable, last-minute drilling jobs: pilot holes for the servo-mounting screws, openings for pushrods, fuel lines, attachment holes for cowlings...and with one of Robart's Carbide Cutters, the MiniMite is ideally suited to routing inside a model to make room for R/C gear and the engine.

A HOLE ALTERNATIVE!

Some drilling jobs are better done with a hand-powered tool. It's safer to enlarge a hole in a wheel hub or a propeller, or to drill thermoplastic material with a hand-held drill. Most drill bits are sharpened to have optimum cutting angles for materials



This is the only safe way to enlarge the hole in a plastic wheel hub! The hand chuck allows slow, gentle drilling action to do the work.

(Continued on page 20)

BUILDING MODEL AIRPLANES

CA GLUES—SAFE TO USE?

A few readers have written to ask about recent rumors about the toxicity of cyanoacrylate adhesives (CAs). The fact is that CAs are completely non-toxic and always have been. Sure, some people have allergic reactions to the acetic acid fumes generated briefly when CA adhesives cure, but a lot more people are allergic to milk, eggs, or wheat gluten...

In the modeling world, it's generally believed that CA was invented by a father-and-son free-flight team in California in about 1960. Not so: CA was invented by Eastman Kodak circa 1950 as a movie-splicing adhesive, which was sold under the name of "Eastman 910." It turned out to be unsuitable for use by projectionists in movie theaters because it instantly glued everything—even fingertips!—together.

Made of 1/8-inch-square balsa sticks, this 2 3/4-ounce model bridge supported all the weight a 5-gallon bucket could hold without sustaining any damage. CA made this project a contest winner for the author's 13-year-old daughter, Loren.

The new adhesive was, however, so strong, and it bonded so many hard-to-glue materials that the Kodak people scouted around for other applications for it. They quickly found one in the aviation industry. Late versions of Lockheed's four-engine Constellation had aileron skins bonded with Eastman 910. Because Lockheed employed many airplane modelers (I was one), word of this new miracle adhesive quickly spread throughout the hobby in Southern California.

Around this time, medical people found out about CA's ability to glue human skin, and somebody wondered whether it could be used instead of stitches to rejoin injured tissue. It was; in fact, in Europe, CA is routinely employed for this today, though it hasn't yet been approved by the FDA in the U.S.

I've been using CA since 1952 with no sign of any ill effects. Sure, my eyes have watered for a few seconds when my face went too close to a CA joint as it "kicked off," but my eyes burned a lot more—and a lot longer, too—in Los Angeles smog and a chlorinated swimming pool.

I think CA glues are the best things to come along in modeling since balsa. They shorten building time tremendously; they make field repairs a snap (even after major damage); and, because of their ability to penetrate deeply into balsa fiber, they're by far the strongest adhesive available for modeling.

such as "free-machining" brass, cast iron, or hardwood. These materials produce small, brittle chips that the drill's spiral "flutes" pull up and out of the hole. In soft materials, however, this action causes the drill to dig into the work and even jam.

Manually powered drilling tools, e.g., pin vises and hand chucks, allow a gentle, firm control of the drill's action. If the bit's point suddenly sticks while you're opening an axle hole in a model wheel, no harm is done. You just back the bit out slightly, then try again with less pressure.

Also, use a drill held in a pin vise to gouge narrow slots in soft

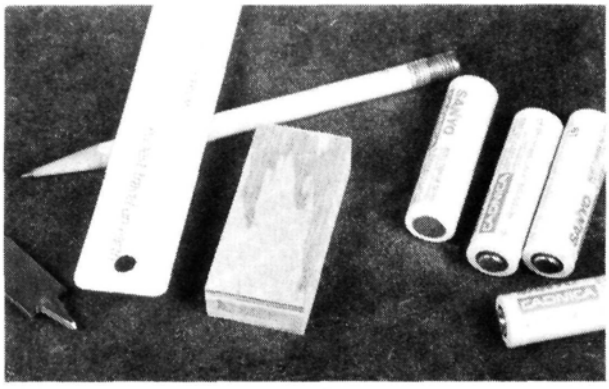
(Continued on page 59)

HOW TO:

by RANDY RANDOLPH

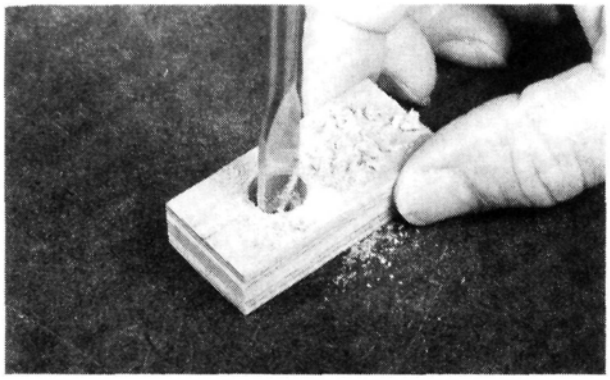
MAKE A SQUARE BATTERY-PACK JIG

In the last few years, the prices of 500mAh Ni-Cd cells have fallen considerably and, to save even more money, many modelers now make their own battery packs. The photos show how to make a jig in which you can assemble a square, 4.8V battery pack.

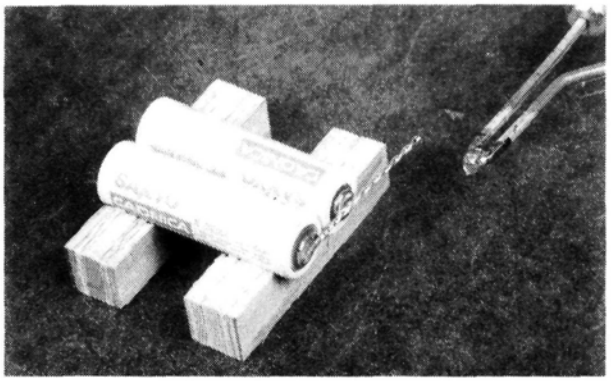


1. You'll need a 1x3-inch piece of 1/2-inch-thick plywood, a ruler, a pencil, a 1/2-inch wood-boring bit, the Ni-Cd cells, a soldering iron, solder and tinned-copper wire.

2. Draw a line along the center of the plywood block, mark its midpoint, and then make two marks, 9/16 inch apart, one on each side of the midpoint. "Center-punch" the block at these marks.

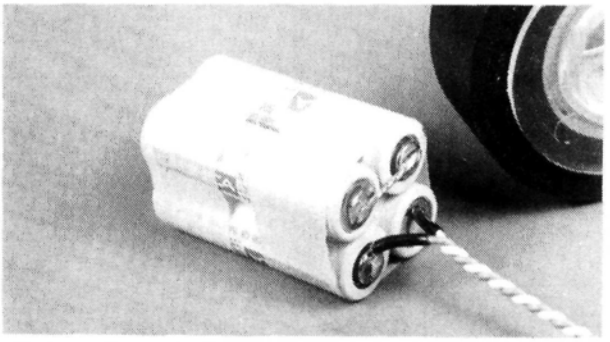


3. Use a 1/2-inch wood-boring bit or a 1/2-inch drill bit to drill holes at each of the "center-punched" marks. When you've drilled both holes, saw the block along its center line to form the two jig blocks.



4. Position the two jig blocks as shown, about 1 inch apart. Put two battery cells in the grooves and make the solder connections. Caution: never solder cells into a battery pack if they have a vent hole in the middle of the positive pole. Remember that cells are wired in series, so a positive pole is connected to a negative pole.

5. Put two cells on top of the first two, and hold them with short pieces of 1/4-inch-square balsa while you solder them. The balsa acts as a buffer between the cells and helps to insulate them from vibration.



6. Secure the pack with two strips of masking tape. When you've soldered the connectors into place, cover the ends of the cells with electrical tape to prevent shorting.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOTS!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1991. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

■ 99$^{44}/_{100}$-PERCENT SCALE

This 1/4-scale J-3 Cub, which was built by James Scroggins of Hollywood, FL, is so realistic in flight that the field controller at his flying field will often call, "Full-scale overhead!" and make the other models land before he realizes that the Cub, too, is a model. James built it from his own plans, and it's true to scale, right down to the modified 35B Clark-Y airfoil. Powered by an inverted Enya 1.20 4-stroke, the Cub has so far logged 218 flights.

■ FLY BOY

Here's young Joseph Lillard from Woodland, CA, with his Hobby Shack Cessna 177, which is powered by an O.S. FP .20. Joe prefers single-stick flying, and his Airtronics Champion fills in nicely there. Starting at this young age, Joseph will be an air ace in no time. If he practices really hard, we might see his name in the lineup at the Tournament of Champions.

■ DIVE-BOMBER DELUXE

From Portland, ME, here's Bill Reeve's interpretation of a fully loaded Dauntless. Built from a Dynaflite Master Series kit, Bill's SBD-5 has dive brakes, retracts, three bomb releases, an operational tail hook, functional trim tabs and stall slots, a fully detailed cockpit with sliding canopies, a scale exhaust, antennas, a bomb yoke and an on-board starter and ignition. The most amazing thing is that, at 13 pounds, this fully loaded deluxe Dauntless weighs closer to a stripped-down version!

■ .010 "TINIEZE"?

"Small Steps" proponent Gary Bullock of Balsam Grove, NC, says, "None of my planes are powered by an engine larger than an .061, so naturally, I'm a fan of *Model Airplane News's* Joe Wagner and Randy Randolph." The .010-powered Varieze is a direct result of challenge made by Randy Randolph to produce a new design for the tiniest engine of all—the Cox TD .010. Guided by a Cannon microsystem, Gary's Varieze has a total of 173 square inches of wing area and an all-up weight of 9.5 ounces!

• • • • • •

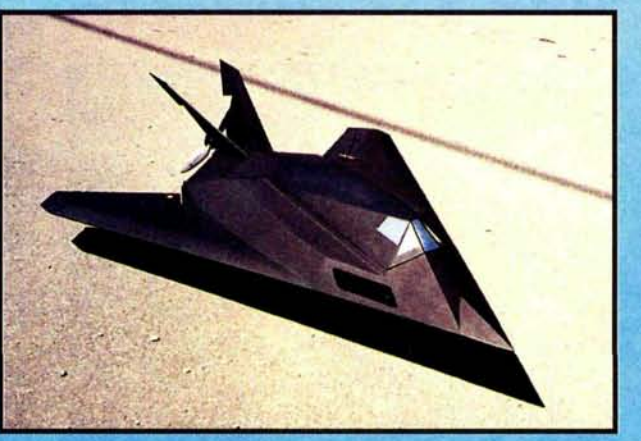
■ FISH'S FOKKER

Robert "Bob" Fish of San Diego, CA, has been reading *Model Airplane News* since 1933 ("...so you know how long I've been addicted!"). Designed by Earl Stohl, the plans for this Fokker D VIII were originally published in the June/July '41 issue. This scratch-built beauty has a wingspan of 57 inches; it's powered by a Fox .35; it weighs 5 pounds, 11 ounces; and it features a hand-painted "lozenge" camouflage, of which Bob writes, "I'll never do that again!" We think the effort was well worth it. After finding the plans for the full-scale D VIII at the Aero-Space Museum, he altered the construction drawing to match the original as closely as possible. The plane is so pretty that Mrs. Fish has been heard to say, "No! I don't want you to fly it!"

• • • • • •

■ STEALTH IN SIXTEENTH

Owing to the cloud of secrecy shrouding the F117, we received this "from-a-distance" declassified photo, but little else. The communication we received was almost entirely devoid of facts, but we *did* learn this much: this 1/16-scale black jet weighs 52 ounces, uses eight cells and is constructed primarily of foam, balsa and fiberglass. We've learned the name of its chief designer/project manager—Larry Whalen—who lives somewhere in Falmouth, KY. We hope more information can be uncovered, or that Larry will come forward with more.



• • • • • •

■ MULTI AMAZEMENT

Like a multitude of other onlookers, Roger Caron of Fremont, CA, was so amazed by fellow club member George Conard's multi-engine model, that he had to write us about his friend's creation. The plane uses a Goldberg Cub wing and has a scratch-built fuselage and tail group. Roger says the four O.S. .15s are "amazingly quiet," and the craft is very aerobatic while displaying excellent STOL characteristics. The best part is that if it loses a couple of engines, it will still land safely with the remaining two—as long as they're not on the same wing!

FRED'S SPECIAL

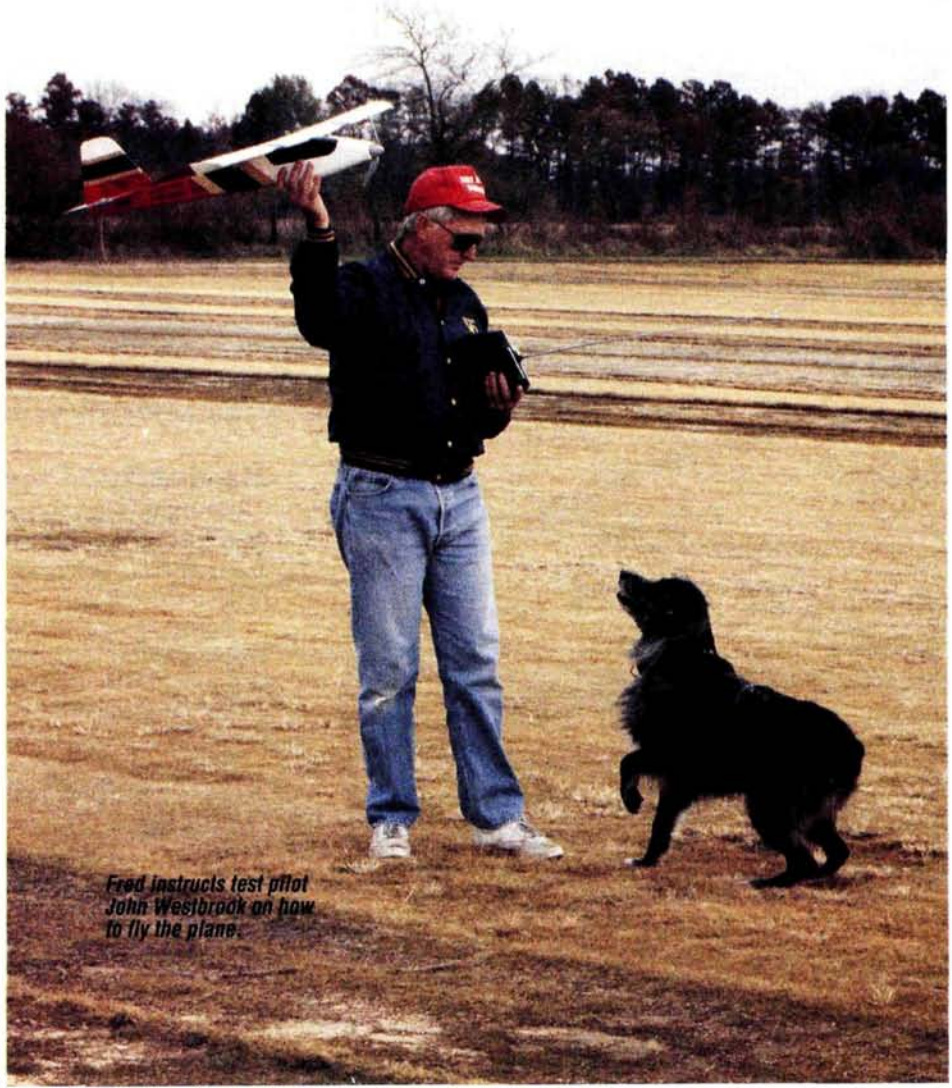
The way an electric airplane ought to fly!

by VERNON WILLIAMS

I'M AN ELECTRIC airplane junkie. I like to walk onto the field, pick up a frequency pin and fly immediately, without having to worry about starting an engine. With electrics, I don't have to haul any messy fuel around, and when I finish flying, I just load the plane in my car and head for home.

A "SPECIAL" BEGINNING

I started in R/C when I saw an Electra kit in a local hobby shop, and I bought it; my life hasn't been the same since! After I had learned to get it up and down with some confidence, I began to look for a sports plane with which to improve my flying abilities. I tried several kits without finding what I wanted. There were, however, several scratch-built planes being flown locally, and two of them seemed to come close: a Mitch Poling design called the "Seagull" and an unnamed model owned by Paul Willenborg, the designer of the Fan Trainer. Although these planes flew well, they required three channels, and they didn't make use of some of the recent developments that had been made in the electric field. I took elements from these and other designs, added my own touches and created a model called

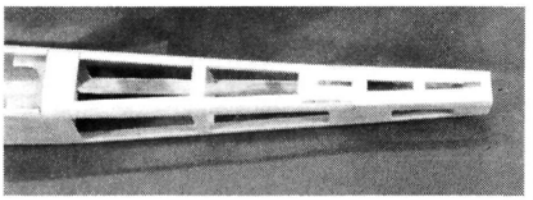


Fred instructs test pilot John Westbrook on how to fly the plane.

"Fred's Special." Its features include:

- a high, semisymmetrical wing. It makes launching easy, and it has enough area to allow good gliding. (Note: this plane is designed to fly—not crash—so don't try to strengthen the wing by modifying it.)
- use of readily available flat battery packs
- simple, light construction

I've made more than 300 flights with the Fred's Special prototype, and it's still going strong. This includes one flight in which it made an inverted landing (caused by a connector that came loose when the plane was at the bottom of an outside loop). This plane thermals well; it's stable, yet highly aerobatic; and it's easy to build. If this seems appealing, then Fred's Special is the plane for you!



On the rear of the fuselage, note the slots in the stab saddle and the top sheeting for the vertical stabilizer.

Several versions of this plane have been flown successfully. Using Hobby Lobby's* Speed 600 motor, a 7-cell 1500mAh Hobbico* battery pack, a High Sky* on/off switch and a receiver pack, Walter Scott's version has made 7- and 8-minute flights.

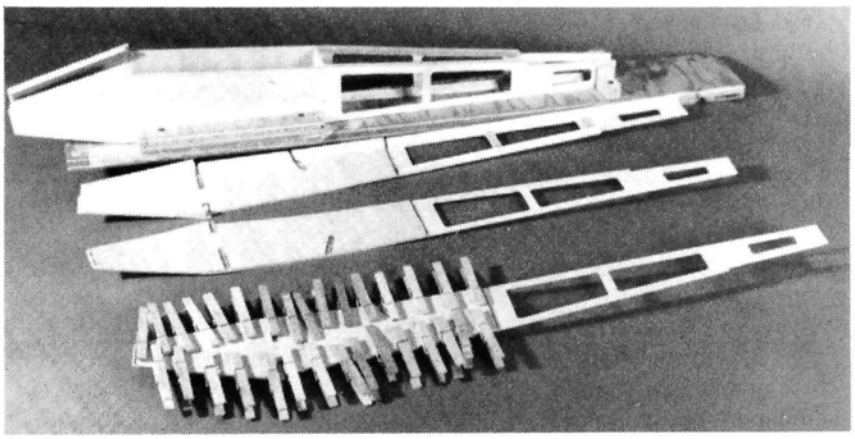
The version of the Fred's Special shown in the plans has made 5- and 6-minute flights, using an Astro* Cobalt 05 motor, a Graupner* 8x4.5 scimitar folding prop (though you have to drill the adapter to fit the Cobalt's larger shafts, this prop works extremely well with this motor), a variety of battery packs, a Futaba* 4NBL and the MCR-4A receiver, which has a built-in speed controller, a battery-eliminator circuit (BEC) and an arming switch. This combination of equipment will provide good performance for a reasonable price.

I've also flown a slightly different version from that shown in the plans. (It isn't as easy to remove its battery pack; its receiver is positioned behind the pack; the flight pack—not the receiver—is in front of F2; and the controller is behind F2, on top of the battery pack.) I use 12, 900mAh SR* batteries, an Astro Cobalt 15, a Futaba FP-T4NBF radio with a 300mAh SR receiver pack, an SPC* speed controller and a Graupner 8x4.5 folding propeller. Using this gear, the plane's performance must be seen to be believed! Snap rolls from level flight are so fast that you can't count them. With a little practice, you can do loops to your heart's content—even outside loops. Fellow R/C pilot John Westbrook is a much better flier than I, and he makes full-rolling 360s seem easy.

CONSTRUCTION

- **Tail group**—build the tail over the plans. It's best to build the elevator in one piece and then cut out the center section. (The elevator shown uses MonoKote* hinges.) The vertical stab's base is made of three layers of 1/16-inch balsa, and the grain of the balsa in the center layer should run vertically. Round the leading edges, and taper the rudder and the elevator as shown on the plans.
- **Fuselage**—make the fuselage sides of 1/16x4x36-inch balsa. Carefully select long, even-grain pieces of balsa with straight edges and no visible defects. I recommend that you make a fuselage pattern out of heavy cardboard stock or an extra sheet of balsa. This will enable you to make the two sides, and you'll still have the pattern in case you have a sudden attack of "ground-rise."

Align the bottom of the fuselage with the



The fuselage assembly sequence—from bottom to top: the 1/16-inch doubler added; the side doubled; the triangle stock added; and the fuselage, which is ready for top sheeting, in the jig.

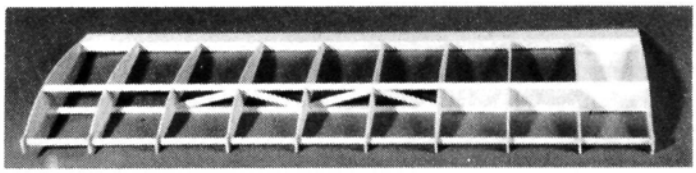
SPECIFICATIONS

Type: Sport electric
Wingspan: 46.5 inches
Length: 32 inches
Weight: 2.5 to 2.75 pounds
Wing Area: 418 square inches
Wing Loading: 14.5 ounces per square foot
Power Req'd: 05- to 15-size Cobalt motor
Recommended Prop: Graupner 8x4
No of Channels Req'd: 3 or 4 (elevator, rudder and throttle; ailerons optional)
Features: modified Eppler 193 airfoil; simple, built-up construction; choice of rudder-only or rudder-and-aileron control.
Comments: the 3-channel version of Fred's Special is a good trainer, and the 4-channel version (with ailerons) is extremely aerobatic. It's designed for superior electric flight performance using either an Astro 05 or 15 Cobalt motor. If you want to surprise the glow fliers at your field with exceptional aerobatic performance, try the new Astro 10-cell, FAI 15 Cobalt motor in this capable model.

edge of the balsa sheet. Mark the corners of the fuselage cutouts by making holes in them with a sharpened piece of 1/4-inch tube.

Install a 1/16-inch, vertical-grain doubler that runs from the rear of F1 to the front of F3. Make sure that F2 and F3 are square with the bottom of the fuselage, and leave a slot in the doubler for the F2 formers. It's easier to do this in two steps: attach the doubler that runs from the rear of F2 to F3; then, using a scrap piece of 1/8-inch ply as a spacer for F2, run a doubler from F2 to F1. Make sure that you leave a 3/32-inch lip. Add the 1/2-inch triangle stock and the wing and stab saddle doublers. Don't forget to add the 1/16x1/4-inch vertical braces at the fuselage cutouts. Note that, on the top and the bottom of the fuselage, forward of F2, there's a small area from which you'll have to trim some of the triangle stock. There isn't a former on the aft end of the fuselage, so I recommend that you make a simple jig (see photo) to hold this end in place while you add the top sheeting.

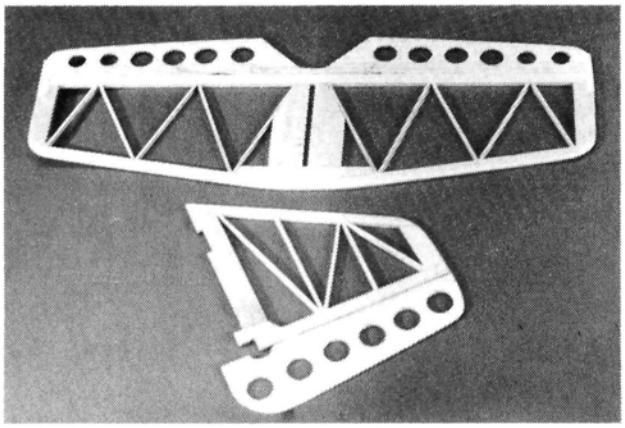
Make the fuselage formers and glue F1 and F1A together, checking that there's an even, 1/16-inch edge around F1. Drill the holes in F1, and then assemble the fuselage with F2, F2A and F3. Make sure that F2 is square with the fuselage sides. Epoxy F1 to the assembly. Round the top of the fuselage in front of F2, and add the top sheeting, including the stab saddle. When the glue has set, turn the fuselage over. Round the bottom in front of F2A, and sheet it. You'll notice a small piece of 1/16-inch ply at F2; this spot takes most of the landing load. Before you round the fuselage corners, mark the hatch perimeter. Its front should be square with the top, and its rear should be square with the bottom (see plan). Make the cross-cuts for the hatch.



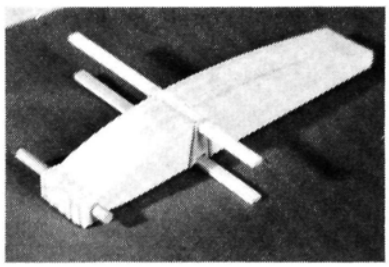
Notice the diagonal shear webs on the right wing half.

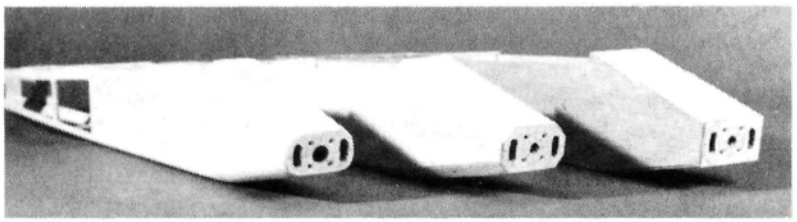
To round the fuselage corners, sand a flat area at 45 degrees to the corner. Refer to the cross sections, and sand the flattened area down to the desired radius. The exposed layers of balsa will help you to keep the corner even. Finish rounding the corners, make the side cuts for the hatch, and attach the 1/16-inch scrap-ply tabs to it. I use a cutoff servo arm as a latch.

Attach B1 and B2, and install the servo tray. Don't attach B3 until after you've installed the radio. Add the 1/8-inch birch ply that will accommodate the aft wing hold-down bolts, and add the 3/16x1/4-inch balsa battery guide. Using a straightedge, draw a center line along the top of the fuselage from the center of F2 to the center of the tail. Cut a slot on this line where the vertical stab runs forward of the horizontal stab. Cut another one in the rear of the stab saddle to accommodate the extended rudder post. These slots should help you "key-in" the tail assembly and align it perfectly.

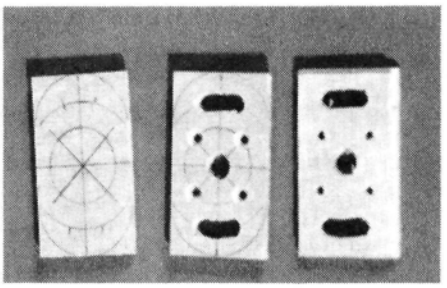


■ *Left: These tail feathers are ready for covering. Notice the extended tail post.*
■ *Below: These wing ribs are ready to be used.*





■ *Left: The fuselage during the "rounding" stages—from right to left: the sheeted fuselage; with the 45-degree bevels sanded on each of its corners; and finished, ready for covering.*
■ *(Bottom) Here's the F1 former with the layout drawn on it (left), with the holes drilled in it (center) and with the 1/16-inch lip on the back.*



• **Wing**—assembly is simple and straightforward. The only thing out of the ordinary is the hardwood-dowel leading edge. The dowel greatly simplifies the chore of making the leading edge, and it strengthens the wing.

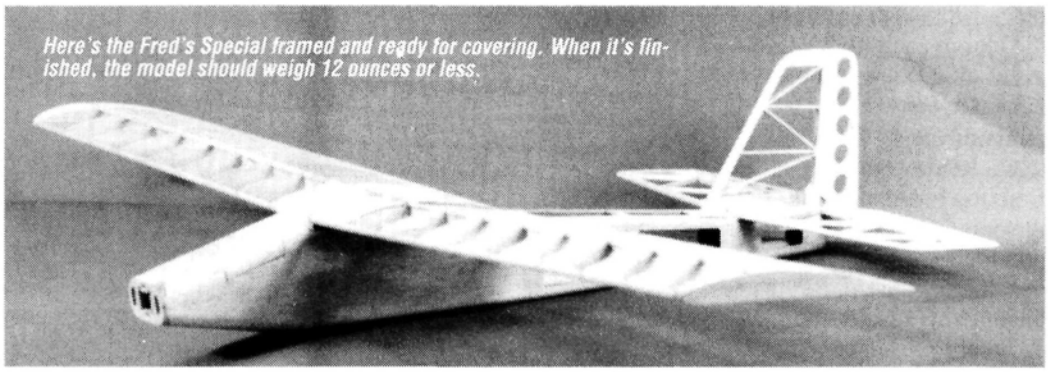
The plans show an aileron wing with 1.5 degrees of dihedral and a rudder wing with 4 degrees of dihedral. The plane will fly well with the rudder wing, but it won't have the aerobatic capabilities that aileron wings provide.

Cut 1/16-inch sheet stock into strips for the ribs, and make a wing-rib pattern using whatever hard material you have on hand (I prefer Plexiglas or Formica). Align the bottom edge of the pattern with the edge of the strip and, using the sharp brass tube, cut a hole in the strip to accommodate the dowel. To hold the stock and the pattern in alignment, insert a short piece of dowel into the hole. Finish cutting the rib using an X-Acto knife with a no. 11 blade.

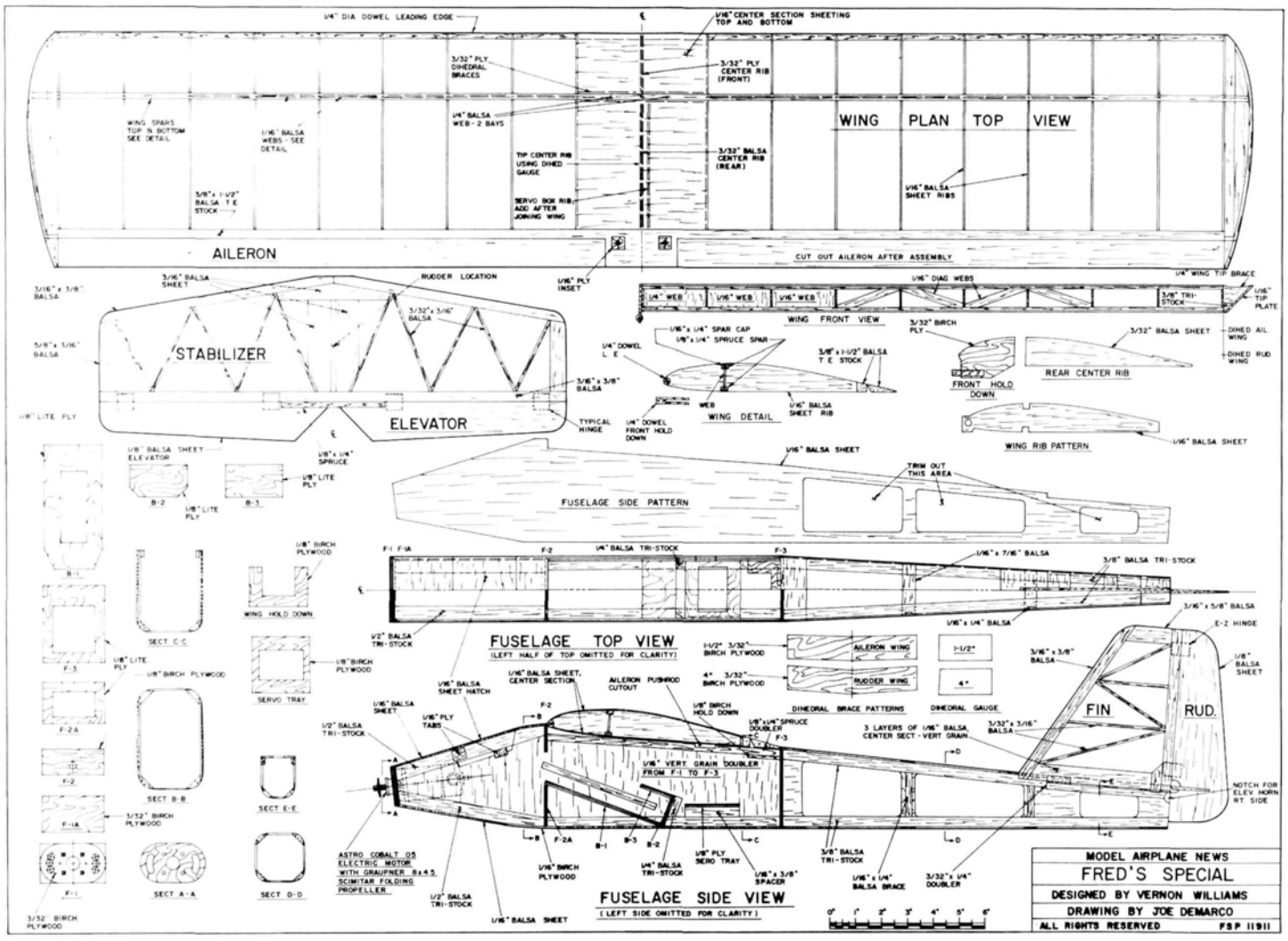
When you've finished making the ribs (including a

few extras for future repairs), stack them, insert a dowel into the leading edge (see photo) and sand the ribs to the same contour. You can shape the spar slots with the edge of a metal file.

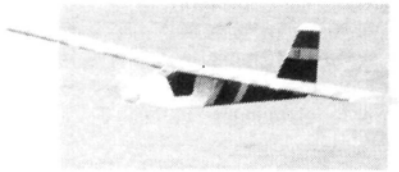
Begin building the wing by gluing the spar caps to the spars. Pin the bottom spar over the wing layout. Use several ribs to space the trailing edge, and pin it into place. Add the bottom center sheeting, from the spar to the trailing edge. To make the center-section ribs, you have to cut 1/16 inch off the tops and bottoms of regular ribs. Just slide the rib pattern down 1/16 inch from the edge of each rib, and cut off the excess. When you glue the ribs into place, use a dihedral gauge that matches the wing you're building to angle the center rib carefully inward at the top. Allow the



Here's the Fred's Special framed and ready for covering. When it's finished, the model should weigh 12 ounces or less.



ORDER THE FULL-SIZE PLAN ... PAGE 124



FSP11911 FRED'S SPECIAL $11

Designed by electric-flight aficionado Vernon Williams, this plane flies "the way an electric ought to." It can be built as an aerobat or as a trainer, and it features a modified Eppler 193 airfoil, built-up construction and a choice of 3- or 4-channel (with ailerons) control. Choose your motor according to how aggressively you want to fly: .05 ferrite; .05 or .15 Cobalt; or an Astro FAI .15 Cobalt racing motor. One full-size sheet. WS: 46.5"; L: 32"; LD 2.

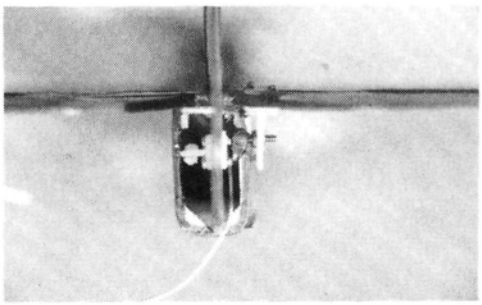
glue to set, and then add the top spar. Next, insert the leading-edge dowel, and twist it as you slide it along the wing. Glue the ribs into place with a dab of CA on the rear of each rib hole.

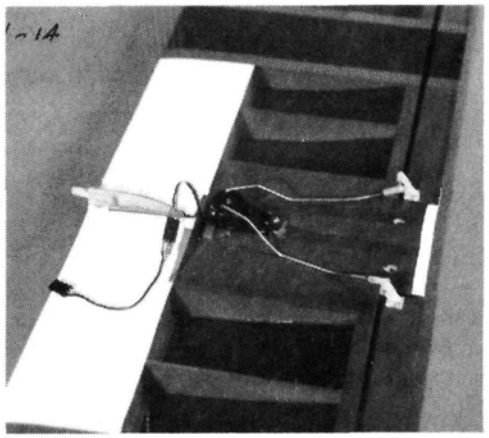
Install the shear webs. Note that the web on the inboard bay is a full 1/4 inch thick. Remove the wing from the board, and cut off the building tabs. Finish the bottom center sheeting, and install the wing tip. Build the other wing half, but remember to reverse the position of the center section and the wing tip.

To join the wing halves, cut the center ribs so that they clear the dihedral braces. Then epoxy both dihedral braces to one wing half, making sure that they touch the bottom sheeting. Epoxy the front 3/32-inch birch ply wing hold-down and the 3/32-inch rear center rib to the inboard rib of that wing half. Use slow-curing epoxy to glue the wing halves together. Again, check that the dihedral braces touch the bottom sheeting, and make sure the leading and trailing edges are aligned.

On the aileron wing, install the half ribs for the servo box, and sheet the top of the center section. Cut out the ailerons, and install the

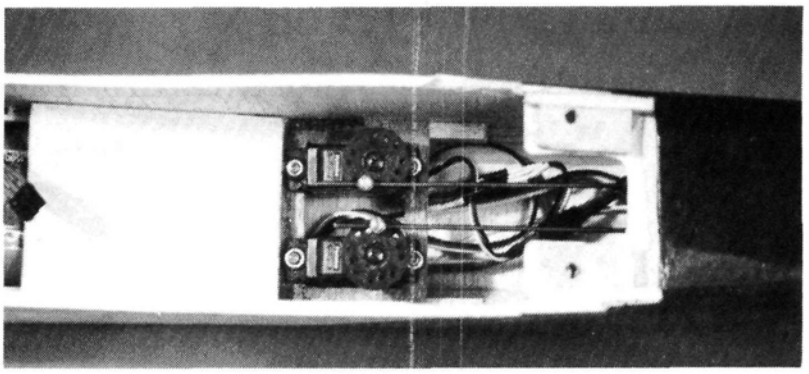
■ *Right: In this photo of the aileron servo installation, you can see that the pushrods run next to the wing. Also notice the differential aileron throw—more up than down.*





■ *Above: Here's the rudder and elevator pushrod hookup.*

■ *Right: Here's the 05's servo installation.*



inset for the hold-down bolts. Don't add the hold-down dowel until the final assembly stages.

• **Covering**—an open structure such as this wing derives much of its strength from the covering. Use a strong covering, e.g., MonoKote. Cover the vertical and horizontal stabilizers separately, and then glue them together. Hinge the elevator and the ailerons with MonoKote as you cover them.

• **Final assembly**—add the wing hold-down dowel. Use a long dowel, and carefully glue it to the center hold-down with thick epoxy while you hold the wing on the fuselage. You can hold the dowel through the hatch, just be careful not to glue the wing to the fuselage. Next, cut the dowel to the proper length. Drill and tap holes for the 10-32 rear hold-down bolts, making sure that the wing's center is aligned with the fuselage's center line. Glue the vertical stab to the horizontal stab, checking that they're positioned at a 90-degree angle. Epoxy the tail assembly to the fuselage.

• **Radio Installation.** The

(Continued on page 59)

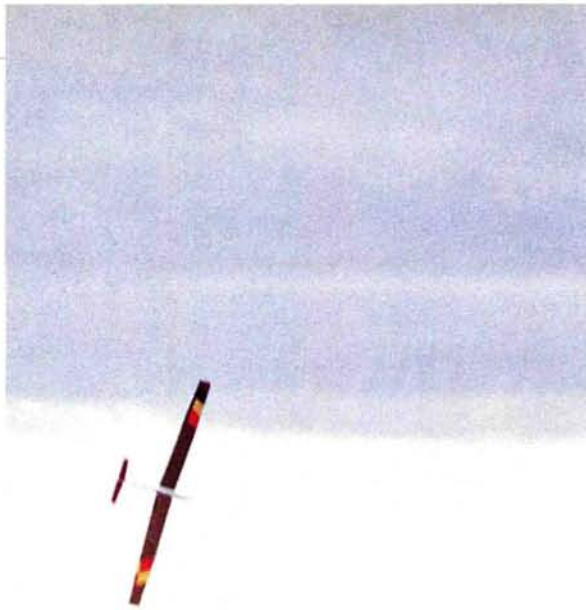
ELECTRIC FLYING DO'S AND DON'TS

DO'S

- Use an arming switch.
- Make sure the throttle is off before you press the arming switch.
- Put a fuse into the motor circuit. The automotive-blade type works best.
- Check that your battery is fully charged.
- Leave the transmitter on until you turn off the receiver.
- When you walk out to pick up the plane, hold the throttle in the "off" position with your thumb. The motor isn't dead until you switch off the receiver. The motors are quite powerful, and they can do as much damage as engines.
- Between flights, remove the battery and leave the hatch off so that the motor can cool.

DON'TS

- Don't put the fuse between the battery and the receiver; put it between the receiver and the motor.
- Don't install a propeller until the motor and the radio have been installed and tested. Motors start at full power, and an unexpected start could mean a real tiptoe through the tulips!
- Don't press the arming switch until you're ready to fly.
- Don't waste your battery's power by testing a motor on the ground. Try the radio once; then, when you're ready to launch, press the arming switch, try the motor, and launch the plane. Batteries generate the most power during the first 30 seconds of flight; the plane needs this power for climbing, so you can't afford to waste it on ground tests.



1 • 9 • 9 • 1

Mid-Columbia Slope Race

by WIL BYERS

Racers Rich Tilman, Don Edberg and Greg Lewis during the heat of battle.

SLOPE SOARING is the type of flying an R/C soaring pilot turns to when he wants to race model gliders in fast, head-to-head, absolutely thrilling competition. The competition format used is pylon racing. It's the pinnacle of speed and performance in R/C soaring; a place where a model's structural integrity and design are tested in a gruelling environment; a racing environment in which winds can be brutal and the pilot must mate his skill with total concentration to avert sudden disaster. Here and only here, a glider pilot has the opportunity to control his model while it's traveling in excess of 100mph.

In this type of competition, he also has the opportunity to

Bill Highfield's hair blows in winds of more than 50mph.

"Their models would often enter the course at well over 100mph after descending from a dive of 1,000 feet or more...their piloting techniques allowed them to perform superb turns, even while the model they guided was within inches of their competitors."

"Almost unbelievably, their models would accelerate through the turns and then instantly be leveled off to shoot down the straight. They'd then skillfully navigate their racers through the figure-8 traffic—traffic that could, and did, result in some explosive, disastrous midair collisions."

PHOTOS BY WIL BYERS

Left: English fliers Greg Lewis and Dave Woods pose with their all-molded slope racer, which later blew up during a high-speed entry.

Below: Dave Woods gives a firm "heave-ho" to launch Greg Lewis's 11-pound model.

experience the excitement of flying practically inches from his competitors' wing tips and very close to the ground. Additionally, he'll be remotely guiding his model as it rides a wave of air that, at times, has a velocity of 60mph. Only one other area of modeling has the same level of intensity and excitement as slope racing.

CASH PRIZES

The Mid-Columbia Cup held on May 24, 25 and 26, 1991, in Richland, WA, was all that and more. It was enthusiastic, world-class race pilots competing head-to-head for $2,100 in cash and, of course, the prestige of taking home one of six top-place trophies. The winner would take home $1,000, while the 2nd-place finisher would get as much as $600, with 3rd place receiving $300. It was a purse that promised to motivate

Above: Racer no. 11—Nova—on final approach to landing.

Center: An Eagle, a Comet and a Nova, which seems to be having difficulty, battle it out.

That area is FAI powered pylon racing; but those models make a lot more noise!

Racers identify models before the race.

Pete Marshall, a race worker, examines the racer held by Daryl Perkins.

the entrants to test the limit of their piloting skills.

It was a high-technology event. Entrants had molded-composite aircraft everywhere you looked. It was models zooming by the front of the hill very near the ground. It was spectacular crashes and blown up models for some unfortunate racers. But most of all, it was excitement, thrilling performances, intense competition, and fun for all in attendance.

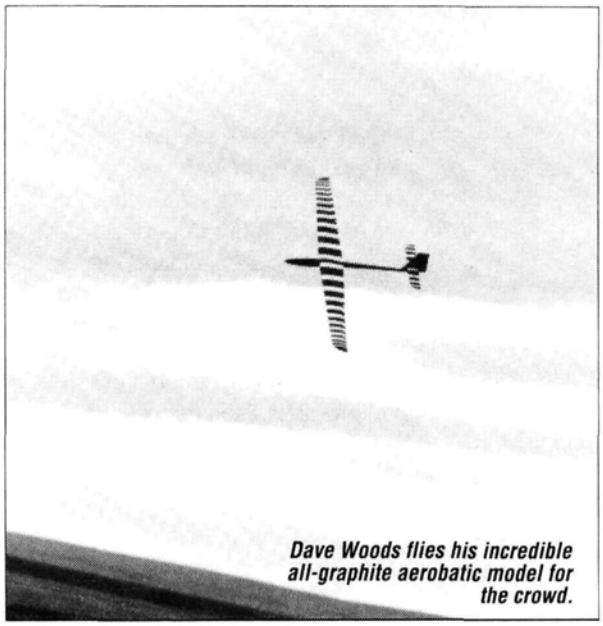
A PREMIUM ON SPEED

Like any race, this was about speed. More specifically, it was about the speed required for a model to complete eight full laps of a 700-foot-long course. These racing models had to fly the course (obviously located on the side of hill) in a figure-8 fashion, where four models compete simultaneously in each heat. They had allotted to them 1 minute after launch to gain as much altitude as possible.

The top three finishers (left to right)—Joe Wurts, 1st; Daryl Perkins, 2nd; Rich Tiltman, 3rd.

Six Top Slope Soarers

Position	Pilot	Sailplane
1	Joe Wurts	F3B Eagle
2	Daryl Perkins	Swift 800
3	Richard Tiltman	Nova.
4	Richard Spicer	Nova
5	Norm Timbs	CSR
6	Ray Kuntz	Own design



Dave Woods flies his incredible all-graphite aerobatic model for the crowd.

Next, following a 1-minute countdown, the pilots dove their sleek racers to enter the course in a flying-start fashion. Then the pilots navigated their models around the circuit in the fastest possible time.

The winners of each heat received one point, while the 2nd-place finisher received two, the 3rd received three, and 4th registered four points. Any model that didn't finish received 5 points. If a model didn't start the race it was awarded 6 points. A "turn cut" penalized fliers one additional lap; two cuts resulted in the racer being given a "did not finish." The format was really pretty simple, but to come out a winner, a pilot needed good flying skills, the ability to judge the turns properly and a model designed for this environment.

"...to come out a winner, a pilot needed good flying skills, the ability to judge the turns properly and a model designed for this environment."

WINDY WAKE-UP

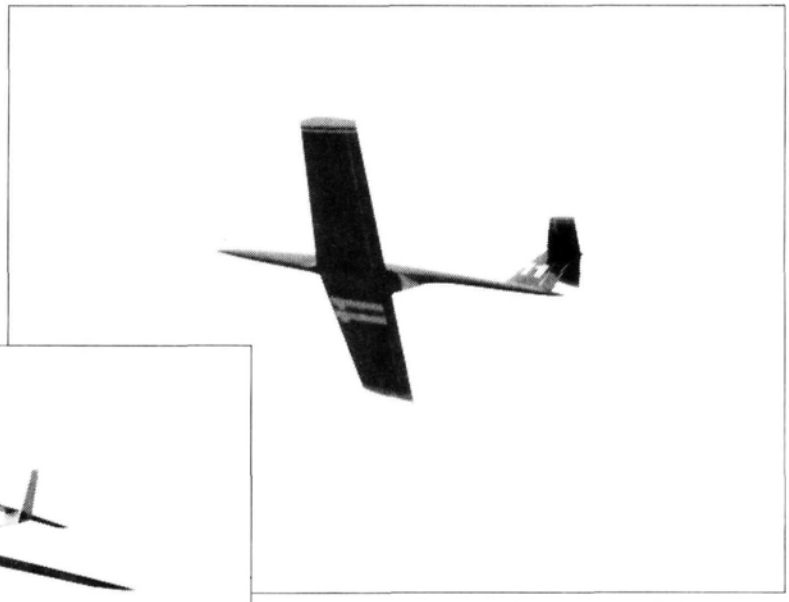
When the morning of May 24 arrived, the race pilots, many of whom had traveled from as far away as England, woke to windy skies—skies that filled them with anticipation of a great race. The wind was blowing hard, so when it interacted

Gerry Arana readies his "own-design" model. His plane suffered from a hard landing, and Gerry was out of the racing early.

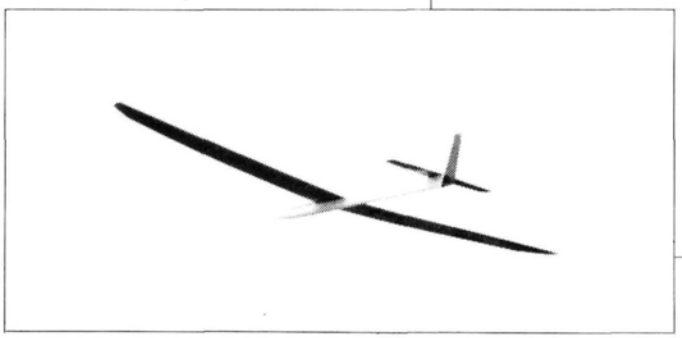
Rich Spice proudly poses with his Nova.

with the slope, it would produce great lift and fast times.

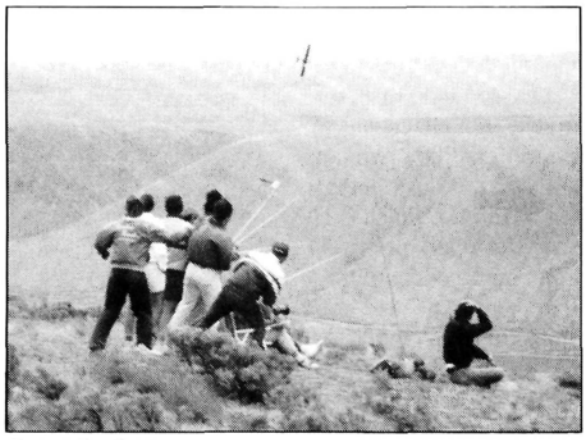
The desert sky was filled with wind, but, more important, it was sunny. This meant that, today, the lapse rate would be enhanced. (The lapse rate is the rate at which a parcel of air cools in its surrounding environment.) Thus, today, the conditions would be ideal for favorable lift generation—lift that would allow the models to carry a load of lead ballast in their search for added energy and velocity; energy that would throttle them down the straight-away at over 70mph. All these elements meant the Mid-Columbia Cup was a race in which both models and pilots would "push the outside of the envelope."



Nova just after launch and beginning to climb.



An Eagle launches into strong lift conditions. Note the wings flexing under the ballast load.



Racers Ray Kuntz, Daryl Perkins, Don Edberg and Rich Spicer during the competition.

A WHO'S WHO

This slope race was the "who's who" of slope racing. It was soaring names such as Joe Wurts, Daryl Perkins (both members of the 1991 F3B team), Rich Tiltman, Ron Vann, Norm Timbs, Rich Spicer, Don Edberg, Ray Kuntz and many others—all experienced slope fliers and racers.

Besides these U.S. racers, the race played host to two English racers of note: Craig Lewis and Dave Woods. Both are long-time slope-soaring enthusiasts and tremendous fliers. Dave was to treat us to some of the most spectacular aerobatic glider flying we had ever seen, after formal racing ended.

In the heat of competition, the racer's skills had to be seen—awesome. They could guide their models down the course with flying finesse, holding a straight and true course with wing tips very near the edge of the slope. Their models would often enter the course at well over 100mph after descending from a dive of 1,000 feet or more. Additionally, their piloting techniques allowed them to perform superb turns, even while the model they guided was within inches of their competitors. Almost unbelievably, their models would accelerate through the turns and then instantly be leveled off to shoot down the straight. They'd then skillfully navigate their racers through the figure-8 traffic—traffic that could, and did, result in some explosive, disastrous midair collisions.

ON THE LEADING EDGE

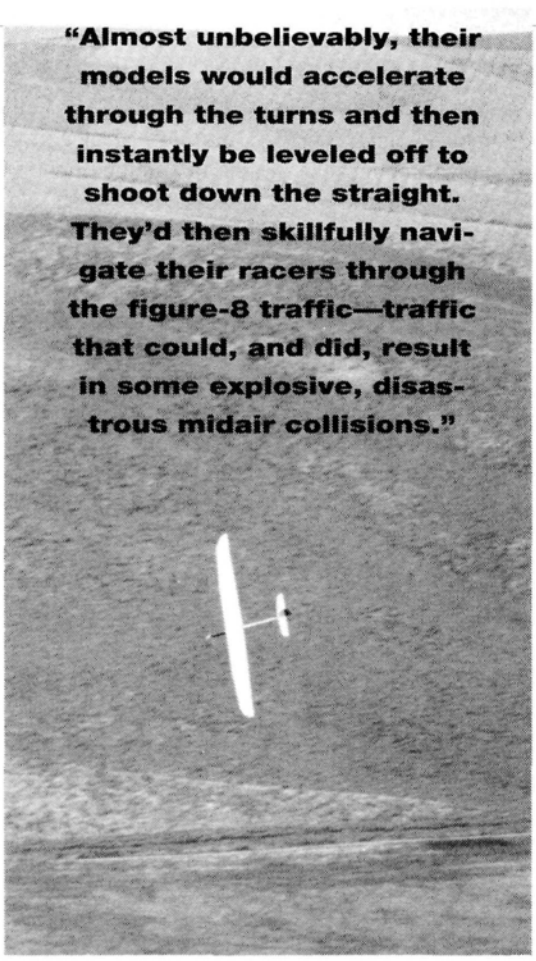
A model will suffer from very high G loadings as it carries in its wings as much as 5 pounds of lead ballast, which can stress a model as it turns tightly at both ends of the course. Models must also be strong enough to avoid both wing and aileron flutter, which arises as the model dives for energy and is sometimes forced to exceed 120mph. Additionally, they must be able to survive the turbulence of a "rotor zone," which can toss them about during a landing approach.

Therefore, when model boxes started to open, it was with joy and admiration that many

looked on inquisitively. Items such as all-molded wings were displayed by their proud owners; wings and elevators in which the halves had been laid-up with epoxy and composites in molds; wings constructed entirely of graphite, or which were a sandwich of fiberglass, Kevlar, graphite, or even the new Spectra cloth.

Construction techniques included vacu-bagging, either over foam or in molds, and we saw trailing edges that were as straight and thin as any we had ever seen. Also, builders put a great deal of time and effort into building control surfaces that fit tightly and were slop-free. They also used state-of-the-art, interference-free radio equipment, with servos that were both powerful and centered accurately for exacting control. Computer radios were almost exclusively used, with either the JR X-347 or the Airtronics Vision being the radio of choice.

"Almost unbelievably, their models would accelerate through the turns and then instantly be leveled off to shoot down the straight. They'd then skillfully navigate their racers through the figure-8 traffic—traffic that could, and did, result in some explosive, disastrous midair collisions."



An F3B Eagle dives through the turn to increase speed.

HEAVY DAMAGE

Models that weren't quite as strong as the conditions required suffered heavily. If they couldn't withstand the G forces, the result was usually a broken wing or wings. In at least one instance, a model that wasn't quite strong enough literally blew up, with the wings obviously becoming pressurized and exploding. But this is expected when performance is "maxed-out" and designs are on the leading edge of technology.

I emphasize that the event was a learning experience, and this is so because many of those who entered were very generous with their knowledge and experience. Those who were there could learn more in a couple of days than they could learn by accident in a couple of years. They could learn which airfoils were fast, such as the RG15, the SD 7003, the Quabeck 1.0-9, the E-374, the E-221, or the S-6061. As well, many entrants unselfishly took the time to explain how to build these high-tech models, explaining details that are almost impossible to get out of a book—things like how to join an all-molded wing; how to install servos in a wing so that they won't pull loose at an inappropriate time; or how to install a T-tail so that it isn't waving goodbye as it dives into the front of the hill. The winning design had a wing area of 939 square inches. It also had an elevator area of 101.5 square inches, which allowed the model to be ballasted to 11 pounds.

TAKE A BOW...

Without a doubt, a slope race is labor intensive. This one was no different, but it did have a great CD, Roy Lightle, who was assisted competently by Ray Kuntz. These individuals managed the task of keeping the event running smoothly. These two fellows worked through any problems and marched ahead with the task of providing good racing. Their point man was Joseph Conrad, who provided very consistent countdowns and hustled the fliers to the staging area to ready them for flying.

Besides these three, the race had many workers who acted as pylon "flaggers," turn judges, and frequency-impound and control personnel. They also provided a concession for the pilots. The scoring was very ably handled by Skip Johnson, who tended the computer. (Skip, by the way, wrote the scoring program, and it assisted immensely in providing prompt scores.)

The volunteer workers took a chance on winning nothing in a workers' raffle that included two X-347 radios donated by JR Radio. Prizes were also donated by *Model Airplane News*, Airtronics, Futaba, Sig Mfg., "R/C Soaring Digest," Midwest Products, Hobby Lobby International, Tower Hobbies, Aerospace Composites, Ace R/C, B^2 Streamlines, Lone Star Models, Robbe Models, Satellite City, SR Batteries, and Vinylwrite.

(Continued on page 79)

Daryl Perkins prepares to launch Don Edberg's Comet.

Design for Flaps, Part Two

The second in a series leading to a construction article • by ANDY LENNON

Actuation, construction and other secrets

WELL-DEVELOPED flaps on a model designed specifically for flaps will produce an aircraft that has high top speeds and is very strong and rugged. It will also have a very wide speed range, and this will permit slow landings (flaps-down) and flight at any speed desired within that speed range. The plane will be more versatile than the average sport .40 and much more fun to fly.

SLOTTED-FLAP DESIGN

Guidelines for a good slotted-flap design:

- With flap extended, the slot formed between the upper forward surface of the flap and the underside of the slot lip should converge or narrow steadily from the slot entry in the wing underside to the exit over the flap top surface. This accelerates the airflow over the flap, delaying its stall and improving its lift. It's the reason the slotted flap is superior to either the split or the plain variety.
- Air flowing from the slot should merge smoothly into the air flowing around the wing and the flap.
- Having an appreciable length of slot lip on the upper wing surface is advantageous.

Figure 1 provides the proportions of a slotted flap for the Eppler 197 airfoil that conform to these guidelines. This is based on proportions developed in the wind-tunnel tests outlined in NACA Report 664, Flap Type 1b.

This flap extends by rotating around a fixed pivot, to 40 degrees. Note that only the top front and leading-edge curves are added to form the flap's profile; the rest are provided free by the wing profile itself.

Figure 2 shows the flap in the 40-degree-down position and provides the proportions of the slot gap and the slot lip overhang. These proportions are important for good flap performance.

Locating the pivot point so that the flap up and 40-degree down positions coincide with the drawing, is done by a simple trial-and-error method.

Trace the flap profile and chord line on translucent material such as onion-skin paper, tracing paper or drafting film. Lay this tracing over the flap

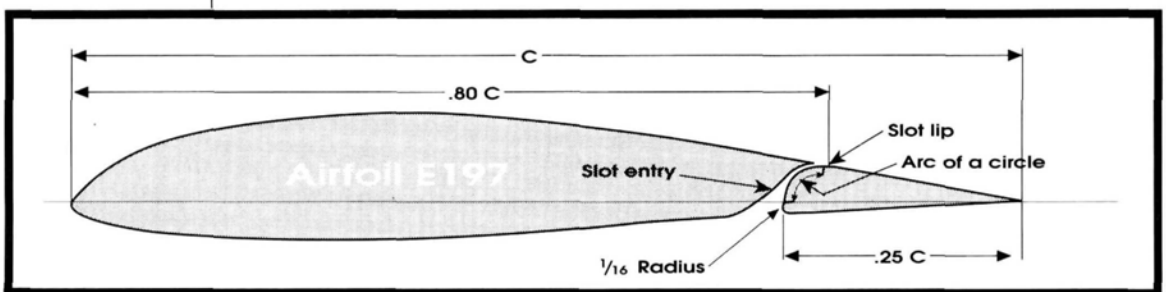


Figure 1: Slotted flap proportions

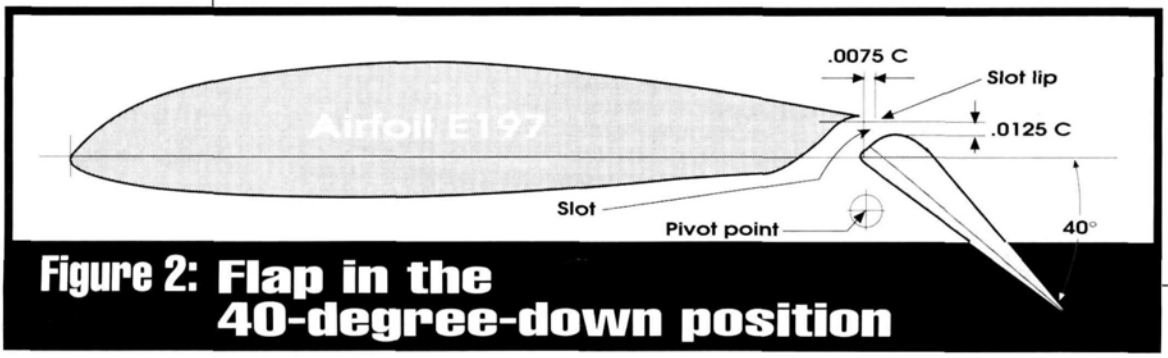
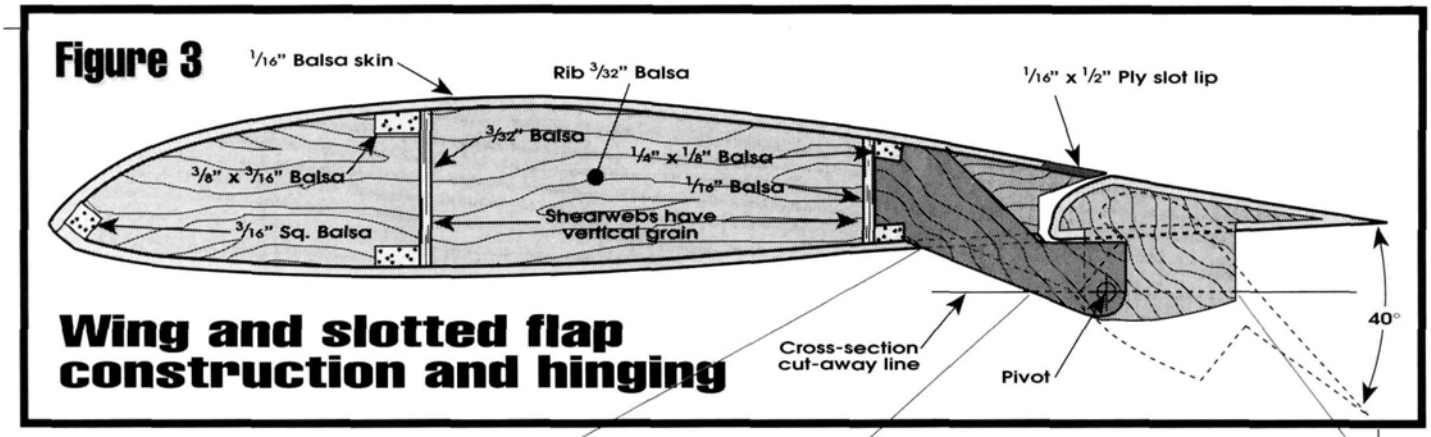
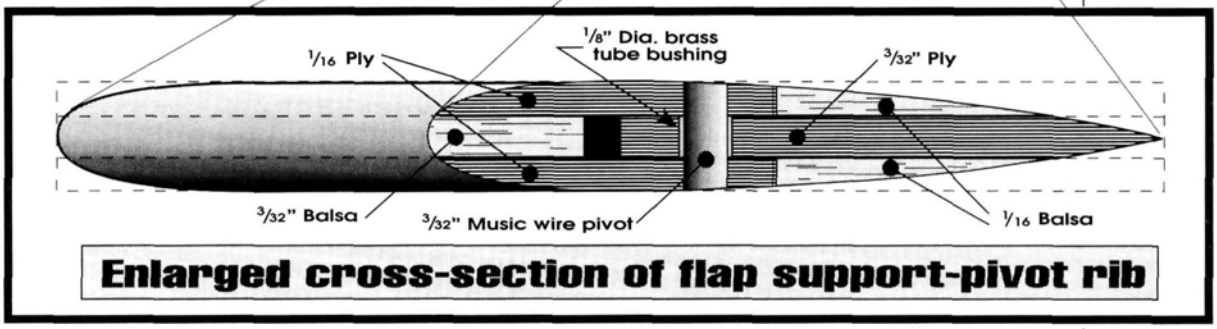


Figure 2: Flap in the 40-degree-down position





drawing in the *up* position. Using a pin as a pivot, rotate the tracing so that the flap extends. Trial and error will guide you to a pivot point where the tracing coincides exactly with the drawing of the flap, in both the up and the 40-degree-down positions. Mark this position carefully on your drawing.

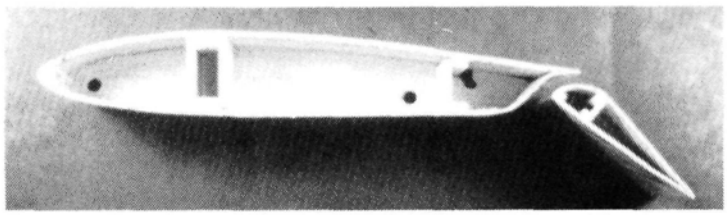
FLAP CONSTRUCTION AND OPERATION

Figure 3 details the structure of both the wing and the flap. The 1/16-inch-thick plywood flap supports and the 3/32-inch-thick plywood pivot and horn ribs are shown in Figure 4. The enlarged section of the "Flap support—pivot rib" shows the sanding required to streamline this assembly.

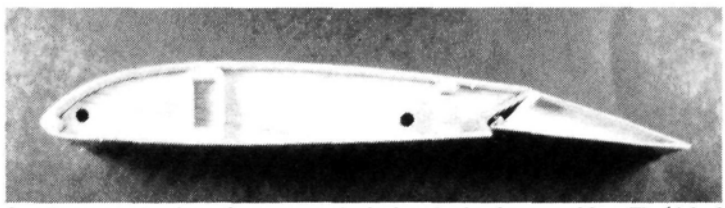
The flap has 1/16-inch-thick balsa-sheet skins on the top and the bottom. Each flap has two pivot ribs and one horn rib—all made of plywood; the rest of the ribs are made of 3/32-inch-thick sheet balsa.

Figure 5 shows the top and bottom views of the assembled flaps for the Seagull III, which is shown in Figure 6. Figure 7 shows the flap-support plywood-and-balsa sub-assemblies for the same model. The plywood still has to be sanded to match the streamlined cross section.

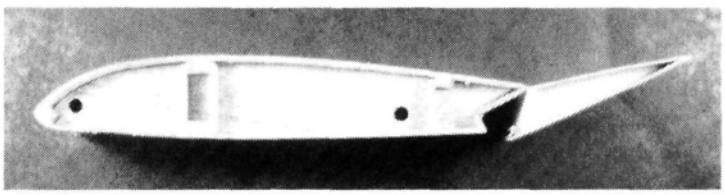
The form of slot entry shown with a dotted line in Figure 1 was used on the Snowy Owl. (See "Design for Flaps, Part 1," October '91 issue.) Although this smooths the airflow into the



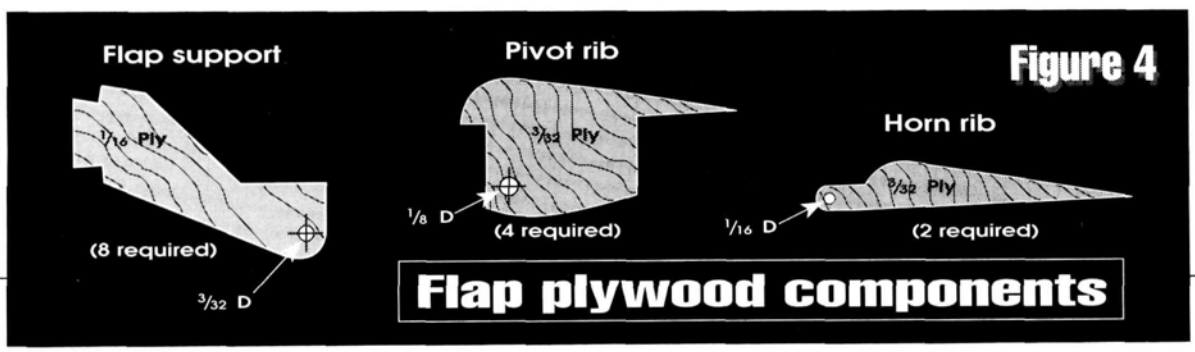
A cross section of an early flapped wing. Note the slot entry and the flap spars. Later designs avoided the use of these spars by using 1/16-inch-thick balsa skins in place of 1/32-inch-thick skins to give simpler, more rugged structures.



An aileron section from the same early design, in the down position. The 1/8-inch diameter lead-wire mass balance is visible.



The aileron in the "up" position. Note the differential compared with that shown above.



Design for Flaps, Part Two

Figure 5
The top and bottom of the slotted flaps made for the Seagull III. The pivot and the horn ribs are visible.

PHOTOS BY ANDY LENNON

Figure 6
The Seagull III

slot, it leaves a drag-producing gap when the flap is retracted. Later designs simply have the lower wing skin extended to the flap's leading edge (see Figure 3) without any apparent adverse affects.

HORIZONTAL TAIL SURFACES

When slotted flaps are extended in flight, a number of things happen:

- Wing lift increases substantially.
- Wing drag also increases, and this slows the model.
- The nose-down pitching moment increases.
- The angle of the down-wash from the wing and the lower flap increases sharply and this impacts on the horizontal tail at a negative angle. This leads to a tail down-load that induces a nose-up pitch.

The outcome of these force changes is some degree of nose-up pitch. This is overcome by applying nose-down trim by means of the elevator trim lever while simultaneously lowering the flaps. With a little practice, this becomes almost automatic.

The nose-up pitch varies with the speed at which the model is flying when you lower the flaps and the extent to which they're lowered.

Experience has proven that T-tail models, e.g., the Snowy Owl, pitch-up to a greater degree than those in which the horizontal tail is in the fuselage, e.g., the Osprey shown in Figure 3.

A T-tail operates in air that's only lightly disturbed by the downwash. It's thus more effective than a lower tail, which is in air that's disturbed by the fuselage, in heavier downwash and in the prop's slipstream. The T-tail is more affected by the increase in downwash angle on lowering the flaps.

GROUND EFFECT AND ELEVATOR DESIGN

In ground effect, at an altitude of less than half the wingspan, the wing and flap downwash angle decreases to roughly half of the angle at higher altitude. This reduces the tail down-load proportionately. This occurs at a bad point; the tail down-load should be increasing to raise the nose to a high angle for a slow landing. Powerful elevators are needed to produce the tail down-load required.

The plane will be more versatile than the average sport .40 and much more fun to fly.

An elevator area of 40 percent of the total horizontal tail area with a travel of 30 degrees up and down is recommended for a model that's equipped with slotted flaps.

In normal flight—flaps up—these large elevators may be sensitive at first, but with experience, you'll adjust to them.

TAIL SURFACE AIRFOIL AND STRUCTURE

Figures 10A, 10B and 11 show details of the tail-surface airfoil and the structural design used on several successful models. The depth of this section provides a very strong, light, simple structure with low drag. The same principles of airfoil and structure apply to the fin and the rudder.

FLUTTER PREVENTION

Well-streamlined model aircraft with

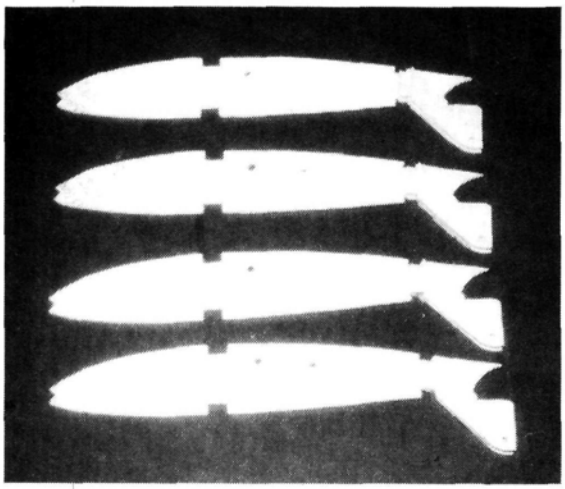


Figure 7
Plywood and balsa support rib sub-assemblies for the Seagull III.

Flap- and Aileron-Actuation Linkages

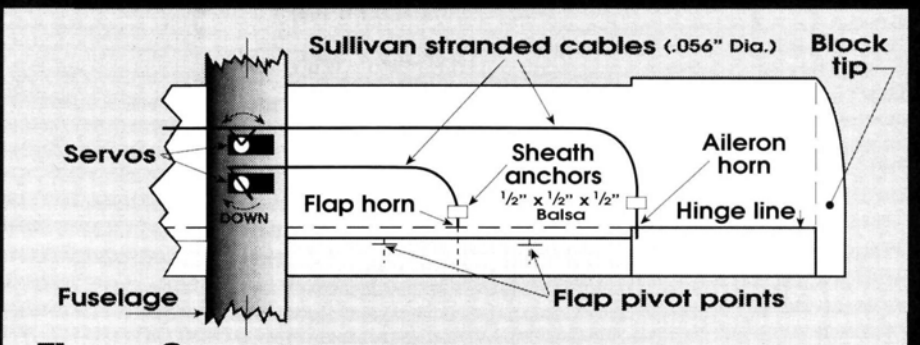


Figure 8: Flap- and aileron-actuation

To operate flaps, a standard servo is adequate. The servo-to-flap (and ailerons) linkage is Sullivan* flexible stranded 0.056-inch-thick cable running in 1/8-inch-o.d. plastic sheaths (see Figure 8). This system gives positive "no-slop" control movement, and I've used it for all control surfaces on several of my recent models.

Using CA, the cable is glued directly into Du-Bro* Mini Link clevises at the control-surface end and into threaded brass couplers at the servo end. The servo clevises are then threaded onto the couplers to allow the control-surface neutrals to be easily adjusted.

Anchor *both* ends of the plastic sheaths by using CA to glue them into small balsa blocks that are cemented firmly into the model's structure. Put a drop of CA to anchor the sheath to each rib or bulkhead through which it passes. These steel cables, which run down the fuselage and into the wings haven't produced any radio interference, but keep the antenna as far away from them as possible.

Depending on the vertical distance from the flap pivot to the flap horn, the stroke needed to lower the flap fully may be more than a normal servo horn can provide. I use Futaba* R/C equipment and, for flaps, I use Futaba's "E" horn, which has longer arms so it will provide the necessary stroke.

You'll need a fifth or sixth channel for flap control. Use either a sliding-switch type, which permits the flap to be extended to any position (from full-up to full-down), or a three-position snap switch, which provides full-up, 20-degree down for takeoffs and 40-degree down for landing.

Figure 9 shows a cross section of the aileron and wing structures showing the NASA "droop." The aileron's action is differential—down 10 degrees; up 30 degrees—and it provides "positive," into-the-turn, aileron yaw aided by the forward lower lip of the "up-going" aileron that extends into the airflow below the wing. This provides a small amount of favorable drag. Turns are made without any rudder action.

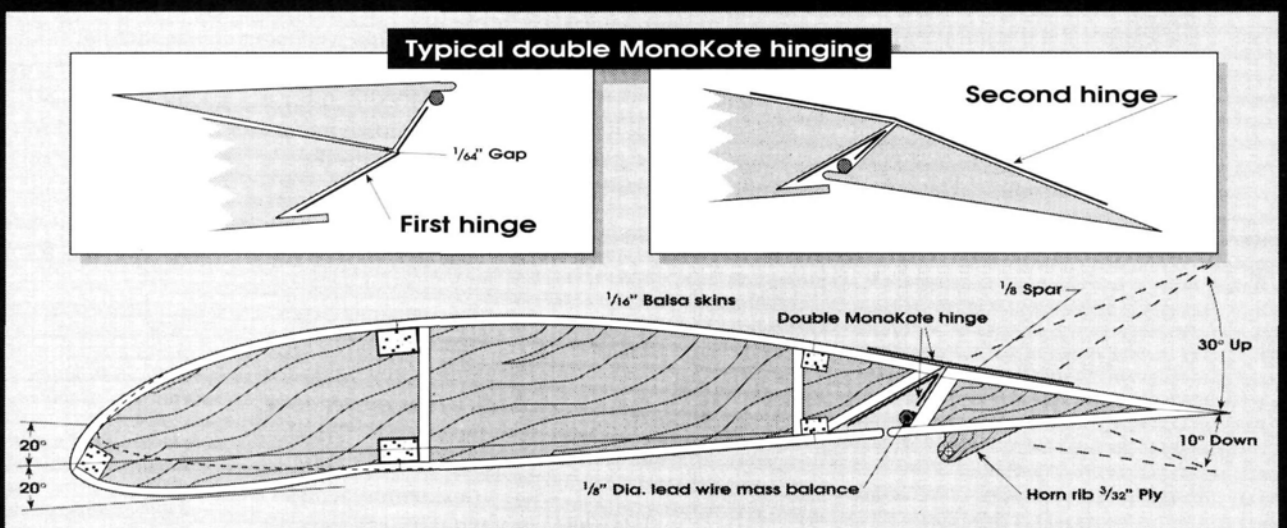
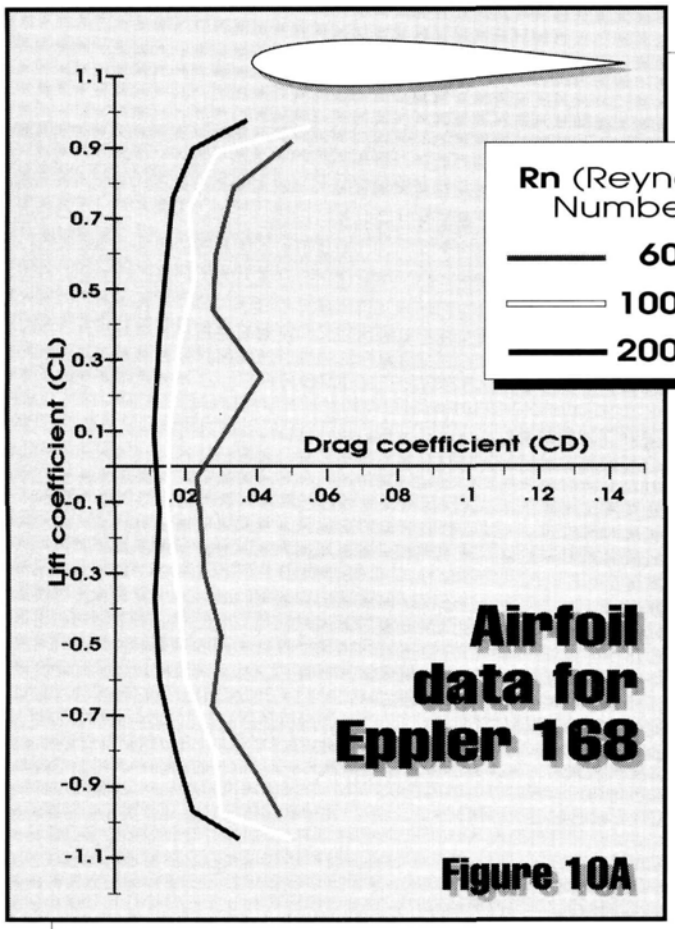
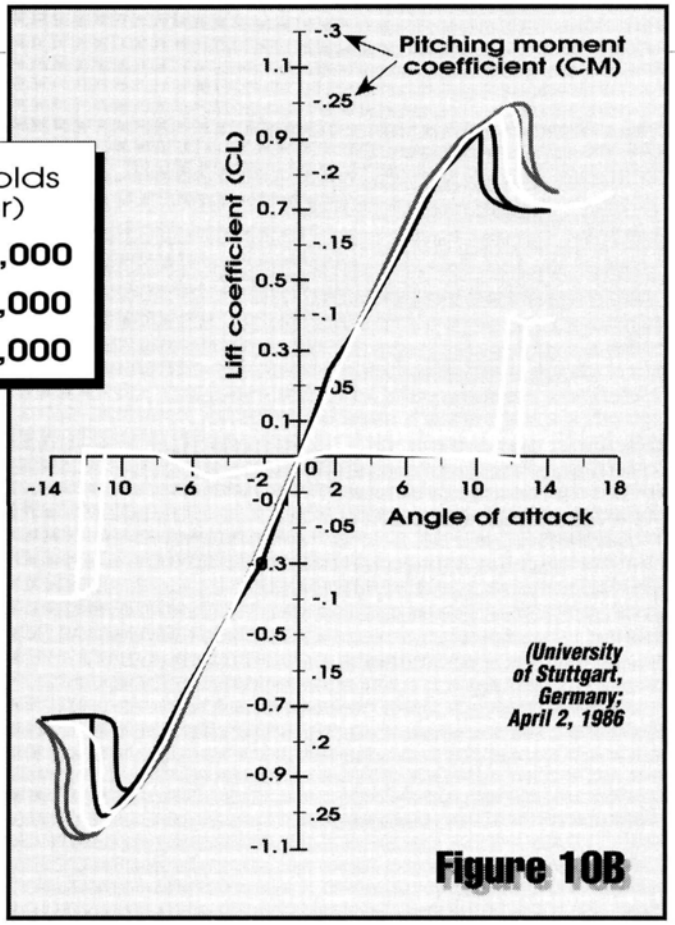


Figure 9: NASA Droop, aileron construction and hinging





Design for Flaps

fairly high wing loadings and powerful engines can achieve very high speeds, particularly when diving. This invites the very real danger of control-surface flutter, which could destroy that surface very quickly and would probably result in a disastrous crash.

This is particularly true of the wide-chord control surfaces inherent in "designing for flaps." The only certain way to prevent flutter is to offset the weight of the control surface behind its hinge with weight in front of the hinge, with both weights balancing at the hinge line.

The modified Frise aileron shown in Figure 8 lends itself to mass-balancing very easily. Shielded horn balsa tips on rudder and elevator permit this mass-balancing (see Figures 11 and 12). Flutter prevention for flaps has proven to be unnecessary. Thanks to their stressed-skin construction, wings and tail surfaces are torsionally very stiff and free of flutter.

Flying R/C model aircraft is challenging, exciting and fun. I hope that "flapped flying" will add to your enjoyment of this sport. It has for me!

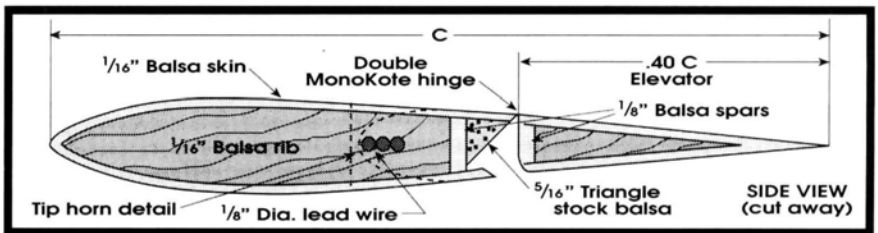


Figure 11: Typical tail surface construction — E168 airfoil

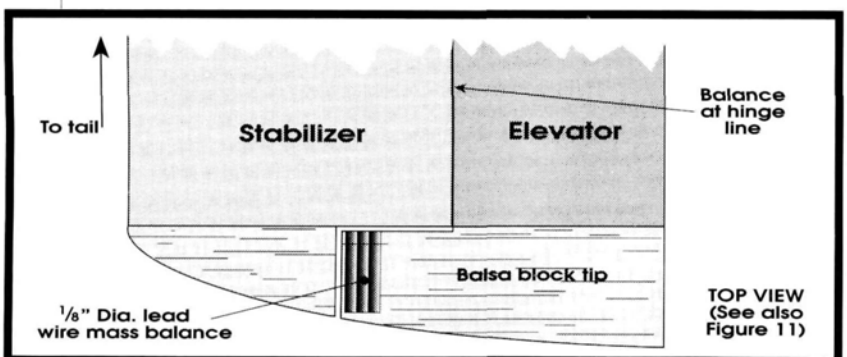


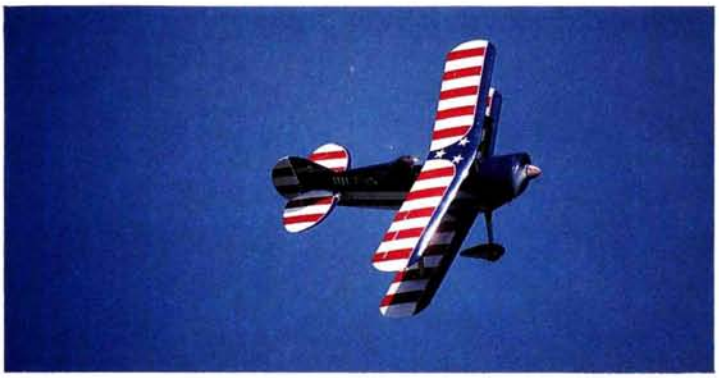
Figure 12: Typical shielded horn and mass balance for elevator and rudder

**Here are the addresses of the companies mentioned in this article:*

Sullivan Products, *1 North Haven St., Baltimore, MD 21224.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.* ■



Ken Spears' Weeks Special. It's a fine, inverted-flat-spin machine.

The gear go up on Marty Young's Byron Hellcat after touch-and-go's. It weighs 28 pounds and is powered by a Sachs-Dolmar 3.7.

1991 IMAA

RALLY of GIANTS

by DAN PARSONS

THE BIG YELLOW Stearman powered by a Sachs-Dolmar 5.8 was commanding the skies with Lomcevaks, inverted flat spins, wing tip spins and other gyrations. This was the sight and sound that greeted Bette and me on Thursday afternoon as we walked onto the site of the IMAA 1991 Rally of Giants, which was held on June 19 through 23 at the North Lake flying field (about 15 miles northwest of downtown Dallas, TX).

It was obvious that whoever was putting that big Stearman through its paces knew what he was doing. Spotting the pilot, I waited until he had finished his flight to walk up and congratulate him. As he turned around, I discovered that old master Jack Strickland had been creating the flying magic. That certainly explained the fine air show; he was one of the top pattern fliers back in the '60s, and he hasn't lost the old touch!

A complete change in tempo was provided by Curly Rucker's rare and beautiful deHavilland Rapide. This twin-engine light transport biplane was expertly flown by Tom Blakeney, who was the test pilot in 1984 and has put many flights on it since then—some even on only one engine. His touch-and-go's were especially impressive. Unfortunately, the next day, a radio problem put this beauty in hard, thus ending seven years of no-damage flying. Curly says it's repairable and will fly again.

By the way, this was one of only two crashes during the three days of flying. With 315 pilots, over 500 planes and five flight lines constantly busy, this has to be close to a record for the fewest problems.

F L I G H T ★ O F ★ T H E

Jack Strickland and his scratch-built 1/4-scale Stearman, which weighs 26 pounds and is powered by a Sachs-Dolmar 5.8.

Larry Steptoe's Ziroli R4D on flyby. Powered by Zenoah 38s, it weighs 47 pounds and is 2 years old.

Jim Christatos' Nosen P-51 on a low, high-speed pass. It weighs 28 pounds and is powered by a Quadra 6.5 turning a three-blade 22x10 Zinger prop.

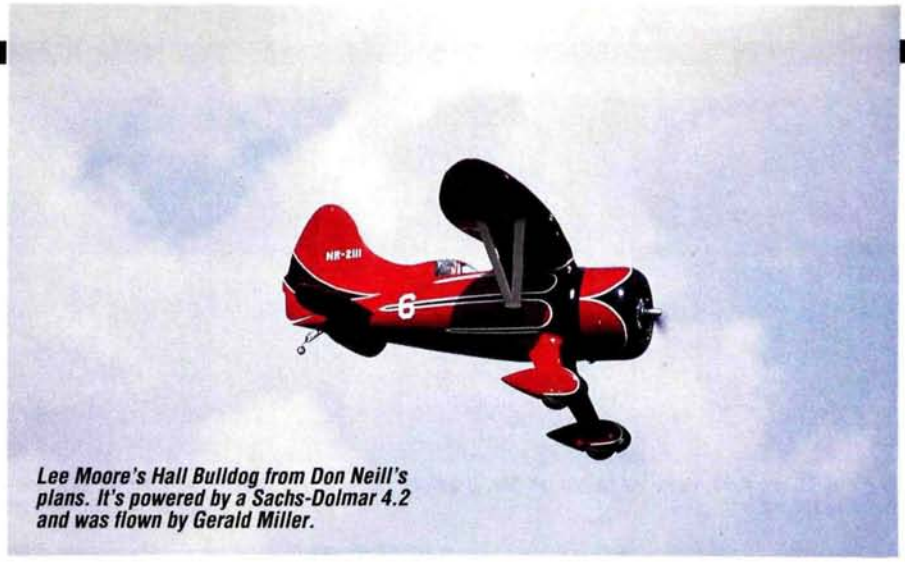
John O'Brien's incredibly detailed 1/4-scale PO-2, which is powered by a Forest Edwards 5-cycle radial. It's a fine flier!

PHOTOS BY DAN PARSONS

TEXAS ★ BIG ★ BIRDS

An early morning shot of about half the pit area.

RALLY of GIANTS



Lee Moore's Hall Bulldog from Don Neill's plans. It's powered by a Sachs-Dolmar 4.2 and was flown by Gerald Miller.

J. W. Jones with his latest masterpiece, an SNJ-5, which shows incredible detail and workmanship. It has been test-flown twice by Ted White and is powered by a Sachs-Dolmar 3.7.

TIGERCAT BELLIES IN

On Thursday morning, before we arrived at the field, my old friend and fellow Albuquerquean Jim Malek flew his F7F Tigercat. Modified to a dash 3 from Bob Campbell's plans, this 10-foot beauty flies well on two G-62s. (I know it does, because we had had an in-flight photo session about a month earlier at a private strip out in the country away from everything.)

On this flight at the Rally, everything went well until it was time to land and one main wheel wouldn't come down. Jim elected to retract the other main wheel and the nose wheel and to belly the big 10-footer in on the grass runway that was parallel to and next to the 650-foot paved runway. Reports were that he made a picture-perfect belly landing. Only one problem: the twin exhaust stacks that extended straight down about 2 inches below each nacelle plowed furrows that would make any farmer proud. This did a job on the muffler-exhaust system, so Jim's flying was over!

Amazingly, there were two other big Tigercats at this gathering, but only one of them flew, and then only once before encountering an engine problem (on the ground, fortunately).

With five planes in the air a good portion of the time, there were plenty of outstanding subjects for me to track and shoot for those interesting in-flight pictures.

I'm partial to twins, so my ears tuned in when Larry Steptoe fired-up those G 38s on his 144-inch, Ziroli R4D (the Navy's version of the C-47). Larry has been flying his big bird for over a year now, so it was surprising to see an almost violent pitch-up immediately after liftoff. Recovering nicely, Larry went on to make a fine flight. A smooth and realistic flier, "majestic" bests describe this excellent R/C model. Later, Larry told me the strong pitch-up at liftoff (he had to put in full down-elevator to regain control) was an out-of-trim condition caused by the large expansion of the plastic pushrod in the 96-degree temperature. These plastic pushrods are a "no-no" in my book, especially on the elevator in large models.

Stinger Wallace puts George Barnes's 1/5-scale SBD-5 Dauntless onto the deck. From Herb Hall plans, it weighs 28 pounds, and is powered by a Zenoah 62.

With one DC-3 type looking so pretty in the air, three airborne together should be three times as pretty—or more. So it was just a matter of time before Tom Holmsley and Guy Lowe prepared their Ziroli DC-3s to go with Larry's R4D. With Stinger Wallace flying Tom's and Jerry Weinberg flying Guy's, the three took off one at a time and flew a racetrack pattern. Though they couldn't get into close formation, it was an inspiring sight, especially as they purred down the runway at about half throttle. Of course, they just *had* to make some low passes with Stinger edging out Larry and Jerry for the honors. Landing one after another, they all made perfect, proper wheel landings with long, straight roll-outs.

I just *have* to brag here. I'm as pleased as punch that Larry's R4D and Tom's DC-3 are covered with the 0.6-ounce glass-cloth that my wife and I have been selling for years.

WARBIRDS WORKOUT

There was a good cross section of WW II fighters being flown by competent pilots. These "big irons" were all properly powered by the big gas engines that provided adequate and realistic vertical performance.

One of the first fighters to go roaring down the runway in a long, smooth takeoff was Monte Pace's Byron Hellcat. With a Sachs-Dolmar 4.2 pulling its 28 pounds, Monte had plenty of power for big loops, long, slow rolls and crisp four-point rolls. His thundering low passes and long, smooth pull-ups were especially impressive. Four years old with over 50 such flights, and it still looks almost new.

Not long after Monte's flight, another big Hellcat made an even longer takeoff run and shallow climb-out with the wheels going into their wells immediately after the smooth liftoff—just like the big boys do it. After some nice aerobatics and long, low passes, the pilot started shooting touch-and-go's. It's rare to see an R/Cer shooting touch-and-go's with a big fighter. After the flight, I went over to the pilot and met Marty Young. I congratulated him on his flying, and he said that, every chance he gets, he watches how the full-scale warbirds are flown. He explained that the touch-and-go's are not only fun but also that "I want to demonstrate that good retracts, properly set up, are reliable." A Sachs-Dolmar 3.7 is in the nose of his 28-pound Hellcat, and Robart retracts get the workout.

As a change of pace from the flying and the pit conversations, there was the always popular exhibitors' area where 20 or so manufacturers showed their wares. They were set up in a large tent just behind the pits—most convenient.

Though hot all three days, medium humidity and a constant 10 to 15mph southerly breeze kept us surprisingly comfortable, especially in the shade of the many shelters that had been set up. The breeze was generally right down the runway, and it helped to keep the planes on the runway during takeoff.

Most of us have heard about "Bedcheck Charlie" who, during the Korean War, flew across U.S. lines at night and dropped nuisance grenades. The plane used for these forays was a Russian PO-2 biplane, and there was a magnificent 1/4-scale example of one at this Rally of Giants. Complete in every detail, including one of Forest Edwards' 5-cylinder radials, this masterpiece was built and flown by John O'Brien—and it flew as well as it was built. It was the talk of the pits. It's interesting that the full-scale plane first flew in 1928 as a primary trainer for the Soviet Union and remained in continuous production through 1944 (approximately 20,000 were manufactured).

Another rare model flown was a 1/4-scale Curtiss P6E Hawk, which was scratch-built by Ron Ables from Barron plans. Ron has been flying it for two years, and his experience with it showed, because he performed some fine aerobatics. On top of that, his takeoffs and landings were flawless—not easy to do with this plane.

Speaking of experienced pilots and great flying, Tom Street was there, putting his 1/4-scale SNJ through an outstanding aerobatic routine several times each day. His smoke system was really putting out and highlighted his huge, very smooth maneuvers. Especially impressive were his long slow rolls and reverse Cuban-8s, with his low pull-outs laying that smoke right into the treetops. Tom is probably best known for the 10-foot Westcraft B-17 that he has been flying so spectacularly for the last six years.

Jim Christatos and Joe Pasztor vied for low-pass honors with their Nosen P-51s. Not lacking in power—an S.D. 5.8 is up front—Joe's 51 has great vertical performance on the 22x14 Zinger. Weighing 9 pounds less, at 28 pounds, Jim's Quadra 65-powered 51 gave an almost equal performance on

"Landing one after another, they all made perfect wheel landings with long, straight roll-outs."

A Sachs-Dolmar 5.8 powers Jack Strickland's big yellow Stearman in a perfectly poised flare just before the picturesque three-point landing.

RALLY of GIANTS

the three-blade, 22x10 Zinger prop. This one prop has been flying his 51 for over two years.

One of the prettiest (and rarest) planes at this meet was Lee Moore's Hall Bulldog racer from Don Neill's plans. In the hands of expert pilot Gerald Miller, the Bulldog flew well. The S.D. 4.2 provided just the right amount of power and probably had much to do with the arrow-straight takeoffs Gerald made. He would take off from the blacktop and then make a perfect landing on the grass runway. One maneuver the Bulldog *doesn't* like is inverted flying, so Gerald said, "Watch this" and inverted it—it didn't stay there long!

Jack Strickland comes back onto the scene again, this time with his 18-pound, 1/3-scale Laser with an S.D. 3.7 in the nose. After a takeoff run of at least 15 feet, Jack pulled his Laser vertical and started rolling. It continued rolling to at least 1,000 feet, where he kicked it into a Lomcevak followed by an inverted flat spin then a wing-tip spin, back into an inverted flat spin and, finally, the pull-out at low altitude. And that was just the *start* of his flight! I'd love to see Jack and Frank Noll put on a routine together.

Another inverted-flat-spin specialist is Ken Spears, who had his new Weeks Special at the Rally. Finally losing his Waco after years of doing many long, inverted, flat spins and other gyrations, Ken now flies the Weeks Special. He also flew a 1/4-scale PT-19 at this meet; it's a far cry from the bellowing, S.D. 3.7-powered Ziroli Corsair he flew for years. Ken allowed, "The slow PT-19 is just loads of fun to guide around the sky."

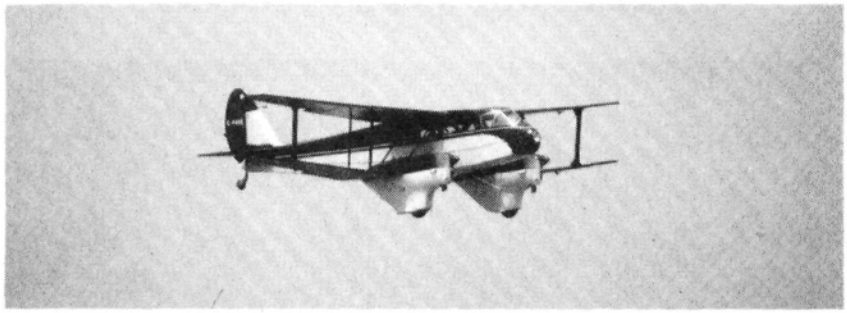
LOW PASSES

On Saturday afternoon, there was a sort of "grand finale" to this well-run Rally of Giants—a thundering, tail-chasing scramble of five WW II warbirds. Four fighters and a 1/5-scale SBD Dauntless took off one after the other. Last off was Gerald Miller's big Nosen P-47. He must have been in a hurry because the Sachs-Dolmar 5.8 and a 15mph breeze blowing right down the runway allowed Gerald to haul his 40-pound P-47 into the air after a 20-foot roll and then make it climb it right on out to join the gaggle. He later explained his "scale" takeoff this way, "I wanted to get up there and get Joe Pasztor's FW 190!" And that's what he did, latching on to that 190's tail more than once. Course, it wasn't too long before the low passes started. Stinger Wallace was again the undisputed "winner" with one of his famous inverted low passes at about 2 feet with George Barnes's big Dauntless. No report on George's reaction, but Stinger later said, "I kept it up a bit so as not to worry George."

Hosted by the Irving R/C Flyers Associated and supported by the city of Irving, this was a well-organized, well-run IMAA Rally of Giants. I talked to many of the participants on the flight line and in the pits and received unanimous agreement on this. It's a great event to attend—not only to fly your plane but also to see many outstanding scale big birds expertly flown by some of the country's top pilots.

Event Manager, Tommy Meyer, Co-CDs, Dennis Cassatt and Ron Anderson and all the dedicated R/Cers who worked long and hard to keep everything running smoothly deserve all the congratulations and thanks we can give them. And to top it all off, there was the always-friendly, "Glad you're here" attitude of every worker I met on this outstanding operation. Texans are great!

"It's a great event to attend—not only to fly your plane but also to see many outstanding scale big birds expertly flown..."



After seven years of flawless showings on the scale circuit, Curly Rucker's uniquely beautiful, graceful deHavilland Rapide fell victim to radio failure. "It's repairable and will fly again," says Curly. A spot on the flight line will be reserved!

VICIOUS SQUALL ALMOST RUINS IT ALL!

Unfortunately, I must end this account of one of the best-yet IMAA Rally of Giants on a sad note. On Saturday night, at about the time the well-attended banquet at the Holiday Inn was ending, a vicious "line squall" passed through and created havoc with the two large tents at the flying field in which hundreds of models were stored for the night. Gusts as high as 80mph finally collapsed both strongly staked tents in spite of the valiant efforts of several people to keep them up. These people were out there for the rest of the night and into the morning, saving planes and helping owners to retrieve theirs. At the last report, three planes had been destroyed and quite a few suffered some damage. I talked to several modelers whose planes, though wet and muddy, suffered no structural damage. Considering the intensity of the storm and that both tents, with their poles, collapsed onto the models, it could have been much worse for many of the modelers.

Tommy and Dennis said that every modeler they talked to on Sunday morning felt that the storm-caused mess was just "one of those things" and that they would return for a future Rally of Giants at the North Lake field. ■

The Ace Micropro 8000 with its LCD display makes programming a cinch. All commands are executed by moving the elevator/aileron stick. To go deeper into the menu, click the option button.

GETTING TO KNOW THE MICROPRO 8000

To understand the programing and mixing in the Micropro 8000 radio, you need to know some definitions and functions.

DEFINITIONS

Absolute mixing: available only when the master channel is a neutralizing channel. It causes the "to" channel to move in the same direction, no matter which way the master channel is moved.
CAL mode: the mode used to calibrate the radio.
Clicking: depressing the option button; it moves you deeper into the menu page.
Master channel: the "from" channel; it provides input from which mixing occurs.
Page right or left: moving the aileron stick in CAL mode; changes the menu page displayed on the LCD screen.
RUN mode: the mode used to fly.
Slave channel: the "to" channel; gets mixed to by the stick input of the master channel.
Slew up or down: moving the elevator stick in CAL mode; increases or decreases numbers being displayed.
Zero point mix: the master channel's position when no mixing occurs. It's neutral for centering channels and must be set on non-centering channels.

FEATURES

Auto trim: pressed during flight, it corrects the trim, automatically returning the aileron, elevator and rudder sticks to neutral.
Battery timer: monitors the amount of time the radio has been on since the battery's last charge.
Channels output: the number of channels transmitted can be set at 4, 5, 6, 7 or 8 for use with receivers in these ranges.
Dual rates: for rudder, aileron and elevator.
Exponential rates: available on throttle, rudder, aileron and elevator control. There are nine curves to choose from.
Flight timer: can be set for count-up or countdown; it has an audio alarm.
Memory: eight aircraft programs can be stored at one time. Options: RS232 computer interface. This allows the radio to upload and download information from your PC, such as set-up parameters.
Pre-programmed mixing: aileron differential, vee-tail and elevon-function mixing can simply be turned on or off.
Servo calibration: end points, center position and trim-authority percentage are programmable for all eight channels.
Throttle preset: moves throttle to any programmed position.
Throttle-trim option: trim can be set to operate throughout the entire range of travel, or only when the throttle is fully retarded.
Voltmeter: shown on the LCD screen; it has an audio alarm.

Setting up your model with the ace micropro 8000

by GERRY YARRISH

A road map for straight-line mixing

The first time I saw the Ace Micropro 8000 computer radio, I was at the 1990 WRAM show in Westchester, NY; I fell in love with it the instant I held it. The 8-channel radio is available with both single and dual sticks, it operates on AM, and it easily meets the requirements for the AMA Gold sticker and 1991 use. The transmitter measures 7x2x7 1/4 inches and it tips the scales at 2 3/4 pounds. It feels heavier than most radios I've used, but it's not uncomfortable to operate. I've been using Ace radios for years, and I've waited a long time for this version to come out.

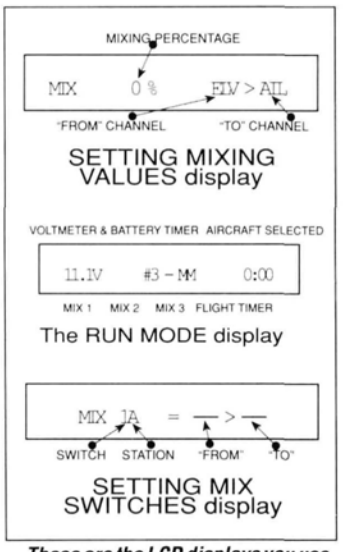
I had read many reports on the 8000, all of which helped me to see what makes it tick. They went into great detail

on how the mixers were set up and how functions were assigned. The fact is, this radio is very easy to use and program. What was missing from these reports was how to use it best in a model. *How do I set it up in my airplane?!*

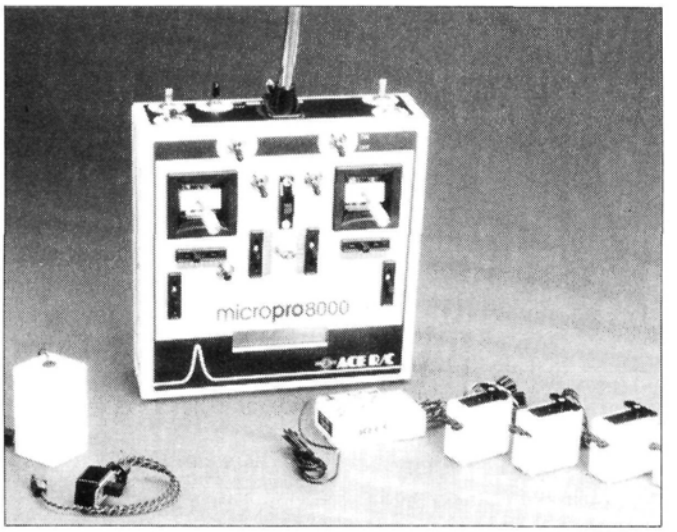
When I received my 8000, I spent a long time reading the factory instructions and I called Ace R/C several times before I actually started to connect servo leads and click buttons. Now, I'll tell you the fastest way to set up yours so you can enjoy this wonderful radio.

THE BASICS

The first things to determine are which types of control you prefer and how many special mixes you want. For this article, I set up a fun-fly stunt ship—the Florio Stunt Wagon—and address its particular needs. If you have a scale model or a sailplane, your requirements will be different, but this article should give you a solid base on which to improvise.



These are the LCD displays you use when setting up your radio. The text explains each in detail.



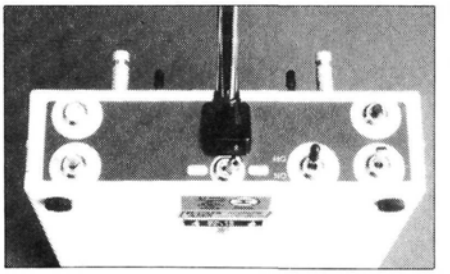
This is a typical Ace system. You have your choice of servos and receiver. The system includes 800mAh batteries, and you can expect 4 to 6 hours of normal use before recharging them.

STEP BY STEP

Here's what we have to work with: eight channels (six proportional, one two-position switched and one three-position switched); an LCD display; eight aircraft memories; servo calibration; unlimited mixing between channels; pre-programmed mixing; dual rates and a throttle preset and a partridge in a pear tree. There are many other features available (I'll explain later), but you'll need these to set up your model.

After you've built your model, decide how many servos you want to use and how many channels you'll need to assign. In the Stunt Wagon, I use six servos: one servo each for the throttle and rudder, one servo for each aileron and one servo for each elevator half. In this way, I have maximum power for my control surfaces and a built-in redundancy in case a servo blows in flight.

When all your servos are in place and you've connected the linkages, the fun begins. In this case, we'll mix the two elevator halves to work as one, and we'll mix the ailerons. As options, we'll include flap trim, flap/spoiler function, coupled flaps and elevators and CAR (coupled aileron and rudder). I know it sounds complicated, but if you remember "master/slave" and "from/to," you'll quickly catch on. The radio has two modes of operation: CAL (short for calibrate) and RUN. All radio set-up is done in the CAL mode, and all flying is done in the RUN mode. A safety locking switch is used to jump from one mode to the other; in the CAL mode, the controls are disabled.



On top of the transmitter is the auto-trim button, mixing switch 2, the CAL/RUN mode switch, the option button and the channel 5 and 8 switches. The CAL/RUN mode switch is a safety locking switch. You must lift it to operate it.

ASSIGNMENTS

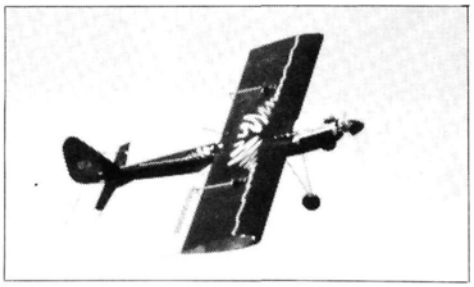
The receiver has eight

SUPERSETUP

- **For flap trim:**
  *mix 1A=ch. 6 to ch. 2 (aileron A); mix value plus 100 percent.
  *mix 1B=ch. 6 to ch. 7 (aileron B); mix value minus 100 percent.
- **For CAR:**
  *mix 2A=ch. 2 (aileron A) to ch. 3 (rudder); mix value plus 20 percent
- **For elevator-to-elevator mixing:**
  *mix 3A=ch. 1 (elevator A) to ch. 8 (elevator B); mix value minus 100 percent.
- **For aileron to aileron mixing:**
  *mix 3B = ch. 2 (aileron A) to ch. 7 (aileron B); mix value minus 100 percent.
- **For elevator to flap/spoiler coupling:**
  *mix 3C=ch. 1 (elevator A) to ch. 2 (aileron A); mix value plus 100 percent.
  *mix 3D=ch. 1 (elevator A) to ch. 7 (aileron B); mix value minus 100 percent.

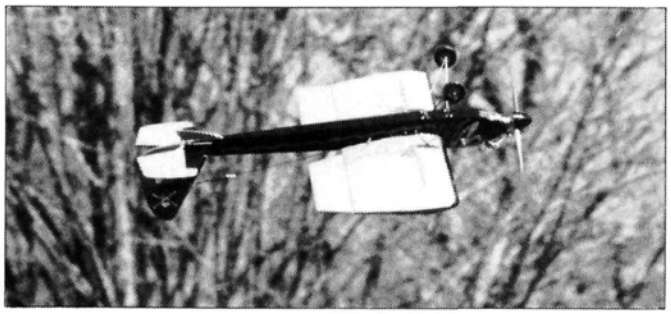
Remember, always mix from a master channel to a slave channel! Then, assign a mixing percentage value and save the settings in the "save new values" menu. It's that simple!

(Continued from page 55)



Today's fun fly designs are very similar to control-line stunt ships. The Micropro 8000 makes setting up the controls easy.

labeled and color-coded channels. Start by connecting the servos. The elevator servo, one aileron servo, one rudder servo and the throttle servo are connected to channels 1 to 4, respectively. The remaining aileron and elevator servos are connected to channels 7 and 8.



Inverted flight is a big part of fun fly competition.

Easy so far, right? Now remember: channels 1 to 4 are all "master" or "from" channels, and 7 and 8 are "slave" or "to" channels. Always mix from masters to slaves. So, it follows that we mix master channel 1 (elevator A) to slave channel 8 (elevator B); and we mix master channel 2 (aileron A) to slave channel 7 (aileron B).

OK! Assign these mixes to switch positions in the radio. These mixing switches are shown on the LCD display as: mix 1A to 1D, 2A to 2D and 3A to 3D. Numbers 1, 2, and 3 are switches, and A, B, C and D are stations. Any mix that you'll want to turn on and off during flight must go to either mixing switch 1 or 2; any mix you'll want to keep all the time will go to switch 3. I wanted the aileron-to-aileron and elevator-to-elevator mixes all the time, so I assigned them to switch 3.

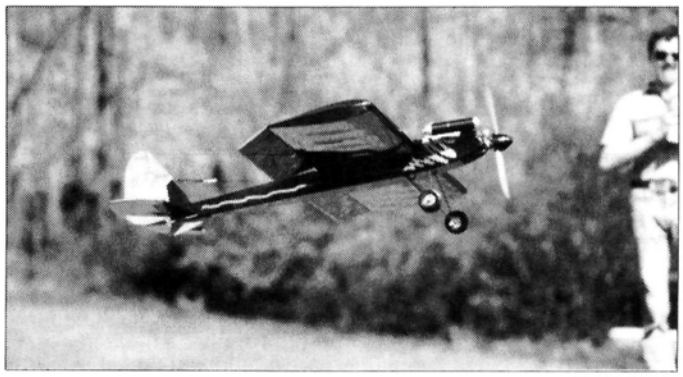
Now set the mixing values, or the percentage of mix between the channels. I set the elevator-to-elevator and aileron-to-aileron mixes at 100 percent so that they'll both move equally. You can also use the mix value to change the direction of the slave servo's movement. For example, say you have everything set up, but when you pull back on the elevator stick, the elevators move in opposite directions. The slave is going the wrong way! Simply change its plus 100 percent mix value to minus 100 percent. This will reverse the value, so the elevators will work together. After you've assigned the mixes and values to their switches, use the "save new values" menu to save the settings. Not too difficult, is it?

With a servo for each control surface, unlimited mixing is possible. Extra power and built-in control redundancy are fringe benefits. Here, the Stunt Wagon comes in for a landing as easily as a trainer.

SERVO CALIBRATION

I really like the digital pulse meter, which actually displays the pulse width of the signal being sent by the transmitter. Generally, the neutral point for servos is 1.5 milliseconds (ms). The Micropro lets you set the neutral point at either 1.5 or 1.31ms (to accommodate the Futaba G AM). You can set the radio's parameters, i.e., end points, anywhere between .80 and 2.1ms.

When you mix two channels and you want to disable the transmitter switch for the slave channel, all you have to do is make the two end-point readings the same as the neutral. In other words, if your neutral is 1.5ms, adjust both your low and your high sides to 1.5ms. The servo still works because of the mix-value percentage sent by the master channel, but the switch on your transmitter will be disabled.



PHOTOS BY YAMIL SUED

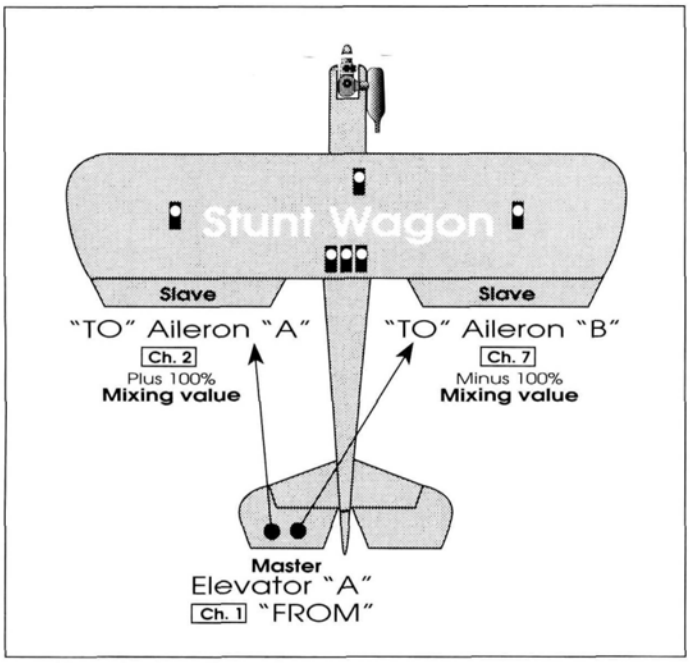
With coupled elevator and flap/spoiler functions, the model can practially hover in for spot landings or touch-and-go's.

COUPLING CONTROLS

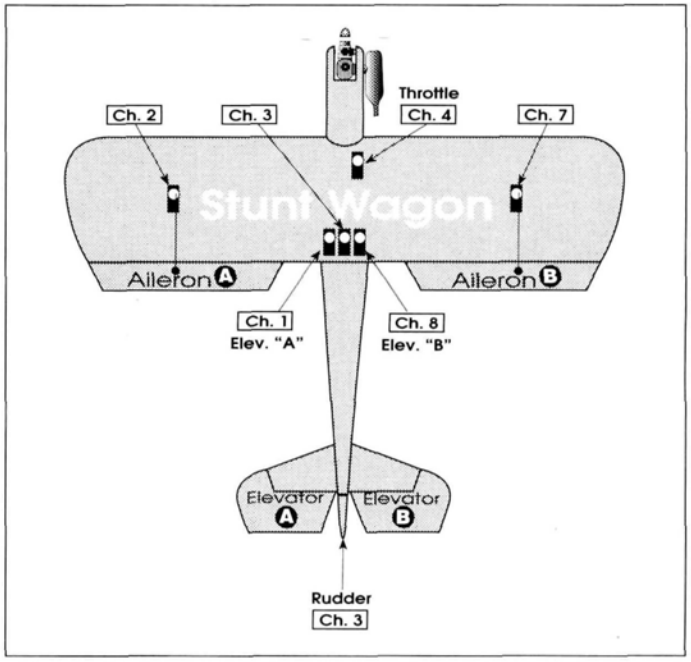
For really tight loops and slow forward flight, mix the elevator with flap/spoiler function. This capacity is

(Continued on page 58)

(Continued from page 56)



Coupling Controls: Elevator to Flap /Spoiler



Assigning Channels

similar to that of a control-line stunt model, and it really makes performance exciting. Mix in a straight line: go from master channel 1 (elevator A) to slave channel 2 (aileron A); then go from master channel 1 (elevator A) to slave channel 7 (aileron B). To get aileron B to work with aileron A in a flap/spoiler function, assign the elevator A to aileron B and mix a minus 100 percent mix value, reversing its direction of travel. I also wanted this coupling of elevator and flap/spoiler on all the time, so I assigned it to switch 3.

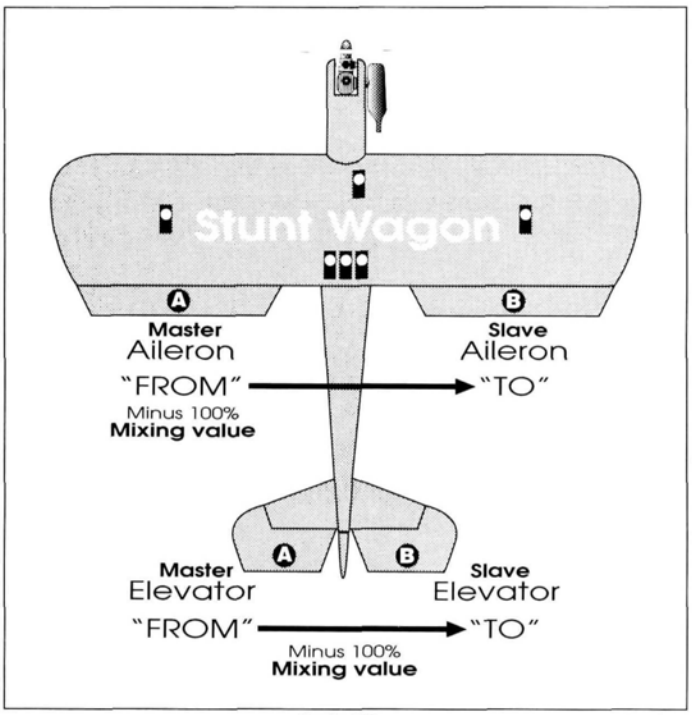
OPTIONAL CONTROL

I like to have the option to switch the CAR and flap trim on and off. I use the flap trim for pitch control during the initial trimming of the model, and I use CAR for sport flying when I want steady, coordinated turns. Flap trim control is easy. Channel 6 is the master channel that we mix to slave channels 2 and 7 (ailerons A and B). Again, the mix value is moved to the minus side for slave channel 7 to reverse its travel direction, but the value for both slave channels is set at 20 percent instead of at 100 percent. This gives us one-fifth the total travel—about right for channel 6's trim function. This flap trim is really nice when you're sorting things out during those first few flights; once you've zeroed in on it, it can help you find the best setting for your style of flying.

This was also useful when I flew in a contest that was at a much higher altitude than my usual flying site. It was very hot and humid. This, coupled with the high elevation, made air density very low, and planes were falling out of the sky. The flap trim allowed me to dial-in some extra flap deflection, and this helped lift a little to compensate. To set up CAR, use aileron A as the master and rudder as the slave. I like a 20-percent mix value, but it can be as much or as little as you want.

Your imagination is the only limit to the mixing possibilities. Whether you fly stunt planes, scale planes or sailplanes, you can map out a direct mixing route and get the control response you want. Ace has informed us of its plans for expanded heli mixing, as well. We'll keep you posted!

**Here's the address of the company featured in this article: Ace R/C Inc., 116 W. 19 St., Box 511C, Higginsville, MO 64037* ■



Basic Mixes

BUILDING AIRPLANES

(Continued from page 20)

wood easily. I routinely use mine as a fine file for cutting the grooves for elevator joiner wires, aileron actuators and similar jobs.

The largest hole you can drill smoothly in soft wood such as balsa or lite-ply is approximately 1/4 inch in diameter. Larger drill bits grab, tear and splinter the material. To make oversize holes, I drill a 1/4-inch hole, then I enlarge it to exactly the size I want with a Robart Carbide Cutter or one of D. G. Products' Permagrit round rasps.

All the tools I've mentioned are available either from hobby shops, or by mail from Ace R/C Inc., P. O. Box 511C, Higginsville, MO 64037. ■

FRED'S SPECIAL

(Continued from page 34)

receiver fits on the bottom in front of F2. (The receiver that I used had a built-in speed controller, so I couldn't wrap it with foam. I attached it to the fuselage with Velcro®.) The rudder and the eleva-

(Continued on page 66)

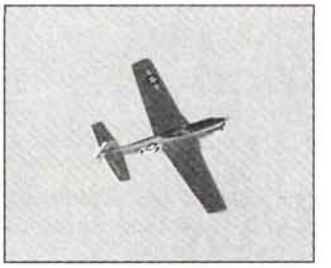
GREAT PLANES

P51-D MUSTANG

by GEORGE JENKINS

THIS 'TANG IS NO NAG!

WITH THE magazine's deadline approaching, I was faced with the problem of building the Great Planes* P-51D for a kit review, as I had promised, but I was running out of time. My solution came when my brother Richard called to let me know he was heading my way on a business trip. We decided to get together the following Friday and have a model-building "blitz," just as we had done some 18 years ago in Illinois. Richard arrived at 8 a.m., and we started building at 10:30 a.m. He built the fuselage, and I built the wing and the tail feathers. We decided to build the kit "by the book," and to put a check mark in each "completion box," just as a modeler who was approaching the kit for the first time would.



THE KIT

The plans and instructions were clean and easy to understand, and the photos were helpful. The construction methods are standard, but this isn't a beginners' kit. The balsa and light-ply die-cutting was excellent, and the parts easily came out of their sheets. (I sanded the reverse sides of the die-cut sheets, and this helped me remove the parts.)

The spars and the leading and trailing edges were very straight. The balsa, however, was medium-to-hard in density, and this made some of the construction difficult, and it also increased the weight of the completed model.

ASSEMBLY

• **Wing work.** Because I was building the wing, I used a wing board for one-piece construction. A wing board is

P-51D MUSTANG

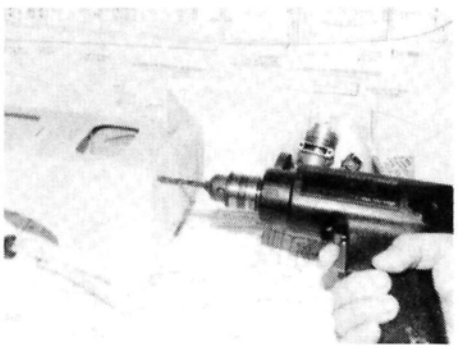
made of two straight, flat pieces of 3/4-inch plywood that have been hinged in the center with two door hinges and then propped up at the unhinged end at an angle that equals the correct dihedral. This allows a true, straight wing with a strong center section, because you can make exact butt joints of the wing spars and the plywood joiner. Also, you can keep the wing pinned down until you've sheeted the top. If you don't have a building board or a wing jig, the method described in the kit's instructions will also work.

I glued fiberglass reinforcement tape on the center section, but I used 5-minute epoxy that I had thinned with alcohol, rather than the CA suggested in the instructions. I've found that plastic coverings stick better to an epoxied center section.

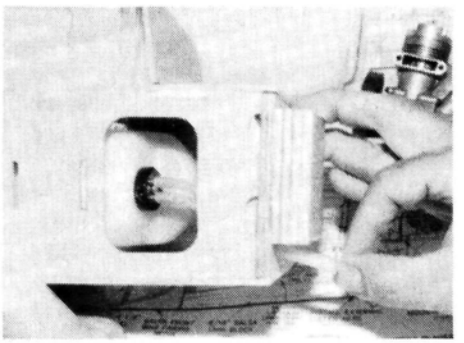
The wing came off the building board straight and true, and I completed the sheeting the next morning (when I looked up it was 2 a.m. on Saturday!). Since speed of completion was important, I didn't build the retractable landing gear.

• **Fuselage facts.** Richard put the fuselage together, and he seemed to have more construction problems than I did. He couldn't find the tail wedge for it, and the 6-32 blind nuts were of poor quality. He had to

"The model is designed for a 4-stroke or 2-stroke engine, . . ."



For proper fuel flow, drill the holes for the fuel tubing in the right places. This is a good time to fuelproof the tank area through the access hole.



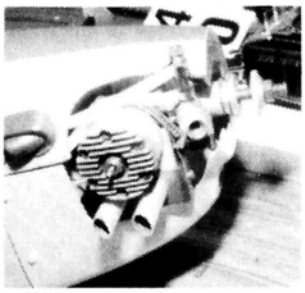
The author pulls the 10-ounce tank into place to trial-fit it. The plywood engine-mount extension is necessary if you plan to use a standard 2-stroke .40 engine.

SPECIFICATIONS

Type: Sport-scale WW II fighter
Wingspan: 57 inches
Weight: 5 to 6 pounds
Wing Area: 580 square inches
Wing Loading: 24 ounces per square foot
Power Req'd: .40 to.60 2-stroke or .60 to.70 4-stroke engine
No. of Channels Req'd: 4 (throttle, rudder, aileron and elevator); retracts optional.
Sug. Retail Price: $109.95
Features: the kit has many formed parts, including a bubble canopy, wing gunports, scale exhaust stacks and a formed cowl. The kit can be built for either a 2- or a 4-stroke engine, but plywood firewall extensions are required for the 2-stroke. The wing has the airfoil of the Ultra Sport 40.
Comments: the kit was built in a marathon building session and no major snafus were encountered. The belly scoop was hard to construct and not very "scale" in appearance. In the flight department, though, the model makes up for these shortcomings: it's a joy to fly! It does all the maneuvers, and it slows down nicely without tip stalling on landings. It will warm the heart of any Mustang lover!

P-51D MUSTANG

run a 6-32 tap through them before the firewall engine-mounting screws could be trial-fit. The model is designed for a 4-stroke or 2-stroke engine, but to take my old O.S. .30 2-stroke, the firewall had to be extended with two 1/4-inch-thick plywood plates sandwiched together. My O.S. .30 has a short crankshaft, and we mounted it on the very end of the nylon motor mount so that it could reach the proper position for the spinner.



The author attached the exhaust and cowl after he painted them with Pactra Formula-U. If you don't have a muffler rule at your field, you can use the direct exhaust by Slimline.

We agreed that the small piece of 1/4-inch triangle stock provided with the kit wasn't enough to reinforce the plywood engine mount (given the amount of plywood mounted on the front of the firewall). We selected 1/2-inch stock and used epoxy for gluing.

I recommend that you fuelproof the inside of the tank compartment and the cowl area by painting them with alcohol-thinned 5-minute epoxy.

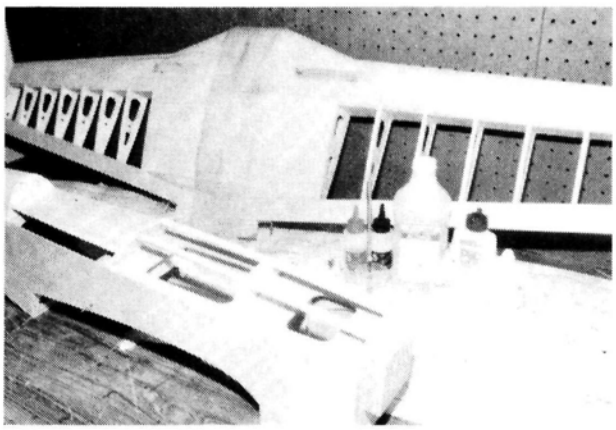
CONSTRUCTIVE CRITICISM

The hard balsa that came with the kit was a real "bear" to bend, even when wet. Thank goodness for CA, masking tape and four hands on this one!

The most disappointing feature was the trademark air scoop under the P-51D's wing. The kit used a die-cut former and 1/4-inch balsa, and what should have been an easy job was hard and I was unable to produce as scale-like a result as I would have liked. The 1/4-inch balsa was rock-hard, and I had to saw it so that it would conform to the sharp bend. Even 1/4-inch sides with triangle-stock corners would have allowed a better-shaped, better-looking air scoop.

Remember to reinforce the plastic cowl with 1/2-inch pieces of 1/32-inch plywood. Attach them with CA or Zap-a-Dap-a-Goo* in the area of the mounting screws. Install the plywood mounting blocks, and allow for the thickness of the 1/32-inch ply for a good flush mount. You can also reinforce the cowl by gluing Celastic inside it; or use fiberglass cloth and CA. Remember that tail-draggers tip over onto their noses, and the cowl will hit the ground first. You'll find that side-mounting the engine improves the plane's appearance, and the smoothness of the model's corners makes it look more like the full-size P-51 than other kits on the market.

"You'll find that side-mounting the engine improves the plane's appearance, . . ."



It's important to match the fuselage to the wing precisely. Brush 5-minute epoxy that has been thinned with alcohol into the fiberglass cloth at the wing center section. The wing ribs have holes, so you can use a building jig.

COVERING

We used two rolls of aluminum-colored EconoKote to cover our new, little warbird. I found the EconoKote much softer, more easily scratched and more sensitive to heat than the Super MonoKote. Buy the covering material when you buy the kit; most P-51 color schemes involve silver and trim. Buy the trim sheets you'll need, i.e., black and white, if you plan to put invasion stripes on your model. As far as I know, the only

(Continued on page 79)

FRED'S SPECIAL

(Continued from page 59)

tor are controlled by conventional pushrods. Cut the rudder control horn off at the first hole so that it will clear the fuselage. The elevator uses a ball joint that's mounted on the control horn. The aileron pushrods run directly from the servo to ball joints that are mounted on the aileron horns. Bend the pushrods (see photo) so that they run close to the wing. The ailerons are set up with differential travel—more up than down (see photo).

FLYING WITH FRED

Now for the good part—Fred's Special can perform most aerobatic maneuvers. Its snap rolls are a joy to watch, and inverted flight requires only a touch of down-elevator. Performing loops and rolls will become routine for you in no time. To recover from spins, you simply let go of the sticks! You can also throttle back and hover—inverted or upright—in 10mph winds. I regularly fly the plane in winds up to 15mph without any problems.

Fred's Special offers a level of perfor-

(Continued on page 79)

FIELD & BENCH REVIEW
by DAVID BARON

PSYCHO MAX

REAL VERTICAL PERFORMANCE

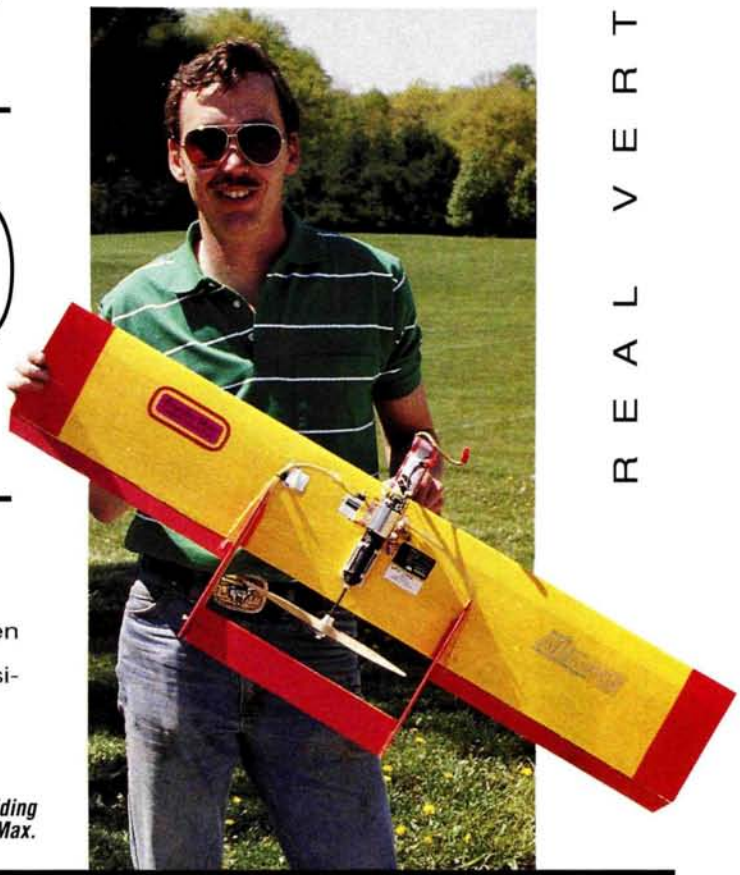
HAVE YOU ever dreamed about the electric performance of the future?—unlimited vertical climbs, long durations, incredible maneuvering ability. Well, wake up and grab your transmitter because the Psycho Max is here.

Model/Tronics'* Psycho Max is a super-agile, flying-wing kit that's designed and engineered solely for electric flight. It combines some of the latest construction techniques with a state-of-the-art power system that sets a new standard for the industry. This model is definitely not for beginners.

MOTOR/GEARBOX

I used a WEP (War Emergency Power) motor, which exceeds any can motor I've seen to date in both raw power and efficiency/duration. (I wouldn't be surprised if it contains some exotic magnetic material.)

The gearbox is similar to Leisure's extended gearbox, with one impressive change: the main drive shaft is made of light, strong, carbon fiber. While I was building the model, I was very concerned that the non-folding prop and the carbon-fiber main drive shaft might be damaged on landing. The manufacturer reassured me that this wasn't a problem because the pusher configuration is much less susceptible to damage. Now, after 50 flights with the same prop, I'm a believer; even when the prop stops in a straight up-and-down position, it simply gets pushed out of the way.



Author David Baron, holding the Psycho Max.

Coming in for a low pass, the model's pusher configuration has proved successful with no broken props to date.

ELECTRO SPEED CONTROLLER

The speed controller comes with a beautiful set of instructions, and it can be adapted to any motor that runs on five to seven cells, including AstroFlight's* Cobalt motors.

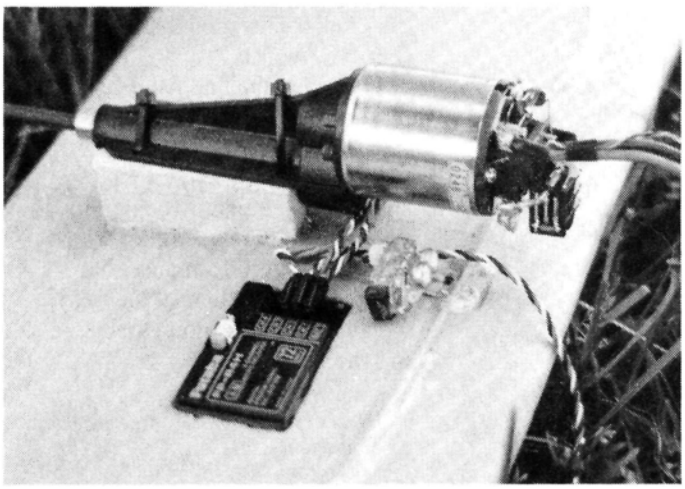
The Mosfets are mounted onto the end of the motor. This arrangement makes so much sense that I wonder why it has taken this long for someone to market it. The power leads are half the length of those in a standard setup, and there are half as many connectors. This adds up to minimal losses! With the motor mounted backward, the system is exposed to cooling air, so it doesn't get hot; it can't! I managed to test the system on more than one occasion, and it's proven to be rugged. It took a "straight down" (Figure 9 maneuver) to break a solder joint on one leg of a Mosfet, but it was repaired in much less time than it took to charge the flight pack!

The speed controller's controller board is built into the wire lead that goes to the receiver. It has the typical high- and low-end adjustable potentiometers that are easy to set. The one thing that this controller doesn't have is an auto-drive battery cut-off that preserves battery capacity for the receiver. Some of you may think that it's a necessity, but with this feature, your system can cut out when you need the motor the most. With the Model/Tronics speed controller, you can manually kill the motor when the battery starts to fade, and reserve power will be available when you need it.

PSYCHO MAX

THE PSYCHO MAX FLYING WING

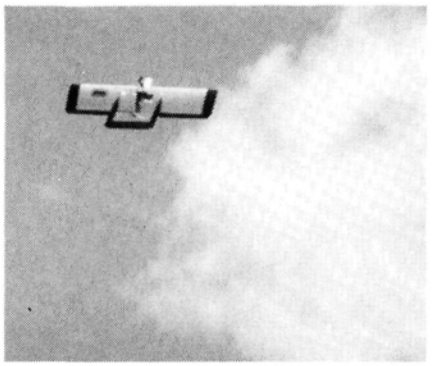
I sheeted the foam wing with 1/32-inch balsa and used the double-sided tape that's included in the kit. Covering the sheeted and solid surfaces is optional. To increase visibility without adding weight, I covered the wing with Lite Span*. Then I glued the rudders in place by cutting back the covering and exposing the wood

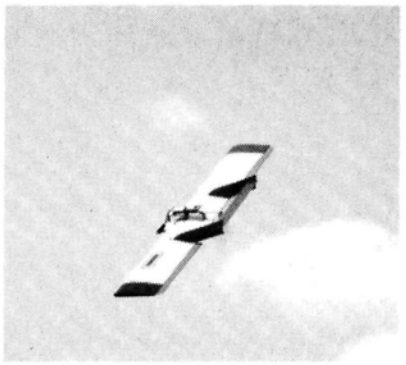


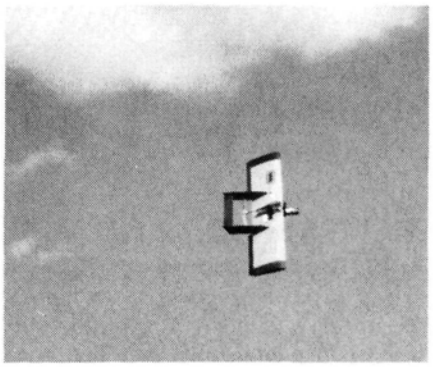
The motor is mounted on a hardwood pylon and is secured with tie-wraps. The receiver and servos sit in their own pockets that are cut into the wing. The Mosfets are shown attached to the motor, and below the motor is the speed controller.

SPECIFICATIONS

Type: Electric, high-performance, pusher sport wing
Wingspan: 42 inches
Weight: 29 ounces (ready to fly)
Wing Area: 315 square inches
Wing Loading: 13.7 ounces per square foot
Power Req'd: 05 electric motor
No. of Channels Req'd: 3 (speed controller, elevator and aileron)
Sug. Retail Price: $39
Features: the Psycho Max has a foam wing and a short-coupled, all-flying elevator hinged between two, fixed vertical fins/tail booms. The radio components are installed into pockets that you cut right into the wing. Everything is out in the open for easy assembly. The wing has no dihedral, and the strip ailerons are easy to install. The foam core is sheeted with 1/32-inch balsa using double-sided tape. (Both are included in the kit.)
Comments: the construction of this kit is different but not difficult. The model can be left unfinished to save weight, but I used Lite Span to improve visability. Model /Tronics offers many can motors from 22 to 14 turns, and the top of the line is the WEP. The Mosfets on this efficient system are mounted right on the motor, and it comes with a switch. Short of an electric helicopter, vertical performance is the best I've seen for an electric design. The Psycho Max glides like a field box, and it isn't for beginners.





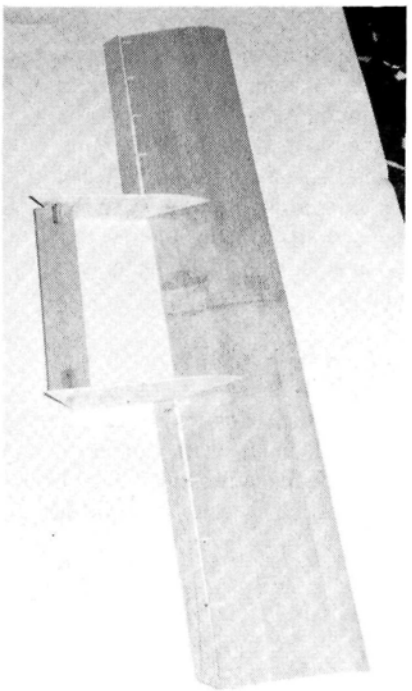


PSYCHO MAX

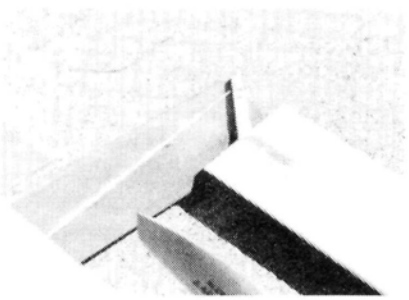
where the joint is made. If this airplane sounds simple, that's because it is!

This plane is made to fly, and it goes together quickly. I made the pockets for the receiver and the servos according to the instructions, but after a few flights, the aileron servo became loose. I shimmed the servo with mixing sticks, but after more flights, it became loose again. Finally, I put a 1/34-inch plywood plate on the bottom side of the sheeting and used mini tie-wraps to secure the servo—a method that works well and is similar to the one used to hold the motor and battery pack in place.

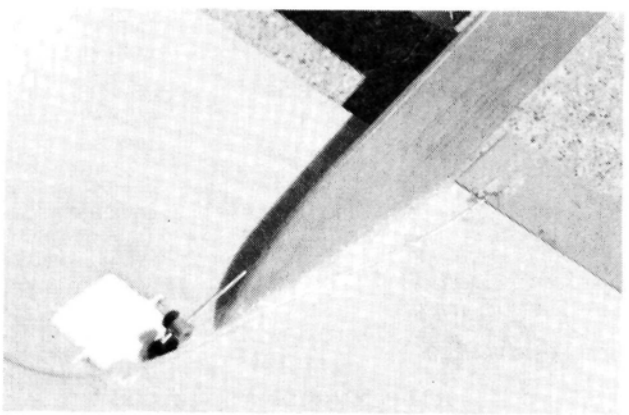
In the instructions, the antenna is shown taped to the wing's upper surface and pointing toward the wing tip to keep it away from the prop. This seemed like "airfoil abuse," so I used a 24-inch-long, 3/16-inch drill bit to tunnel through the foam from the wing tip to the receiver pocket. Then I slid an old piece of Nyrod through the hole, cut it to length and fed the antenna through. Not only does this look better, but you can also install a "strain relief" device on the antenna where it feeds into the Nyrod.



Right: The Psycho Max has a small parts count. Here, it's ready for aileron attachment and final covering.



Above: The control horns are made of thin plywood, and the control cable ends in a simple Z-bend. Note the all-flying elevator.



Right: The elevator servo is in front of the tail boom/vertical fin.

FLYING

The first hand launch can certainly put a lump in your throat, but as long as you follow the procedure carefully, the engine has ample power to take over after a half-hearted throw. The Psycho Max is small and gets smaller quickly after it's launched, but fortunately, it goes exactly where it's pointed. Rolls are smooth and reasonably axial for a semisymmetrical wing. Use only the recommended elevator throw because too much makes the plane tip stall when you use the electro speed-controller system and seven 1400 SCR cells. This model has true vertical performance.

I can imagine that having two of these in the air at once would be a circus. The Psycho Max isn't difficult to build; however, it isn't designed to be flown by beginners. If you're an experienced flier who wants all-out performance that leaves the glow fliers at the field wondering what's going on, get a Psycho Max!

**Here are the addresses of the companies mentioned in this article:*
Model/Tronics, Inc., *3824 24th Ave. West, Seattle, WA 98199.*
AstroFlight, Inc., *13311 Beach Ave., Marina Del Rey, CA 90292.*
Lite Span, *distributed by Charlie's R/C Goodies, 2828 Cochran St., Ste. 281, Simi Valley, CA 93065.* ■

10 Steps to a Fiberglass Cowl

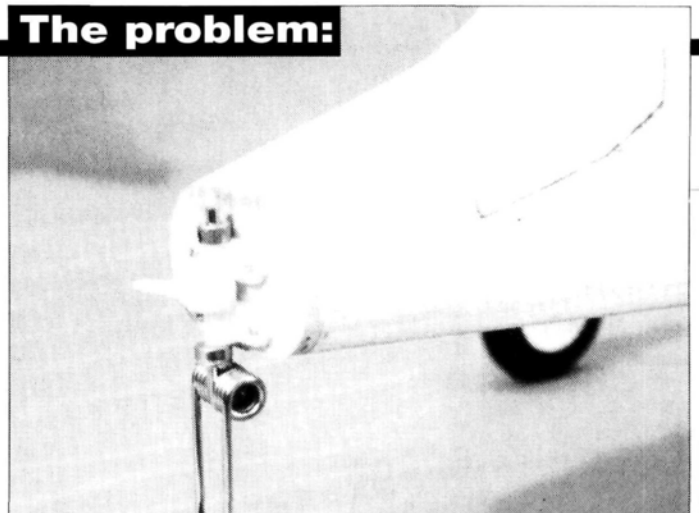
by Vernon Williams

A simple way to custom-make a cowl

SINCE I prefer to scratch-build model airplanes, the problem of how to build cowls came up early in my career. I've devised my own construction method that makes a cowl that's easy to repair. First, I make the basic shape; then I add the necessary parts. Epoxy, aliphatic resin, or one of the odorless CAs can be used to glue the foam, and fillets and repairs can be made with model filler.

In the 10 steps shown, I show you how I finished the nose of my new electric twin. The quality of my one-off fiberglass cowl rivals that of the best cowl kits. You'll need: foam, epoxy finishing resin, glass-cloth, filler, primer glazing putty, paint, wood, gloves and sandpaper. Note that the foam is a closed-cell Styrofoam that's usually blue.

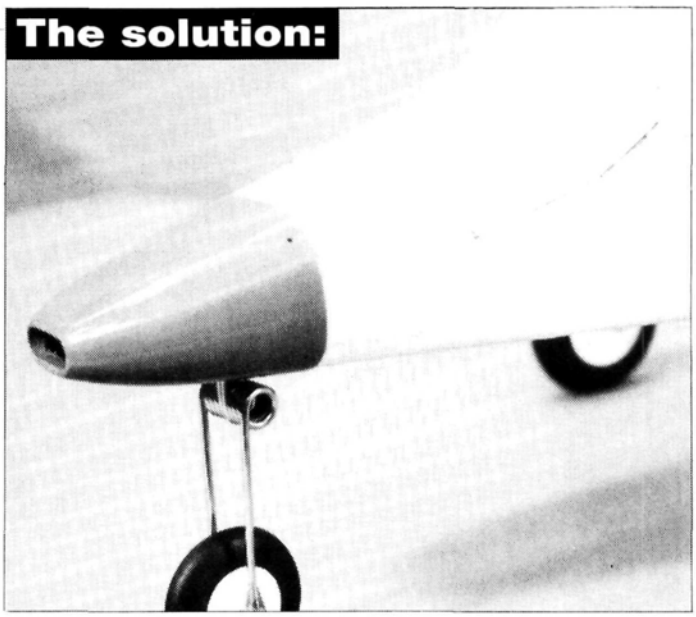
The problem:



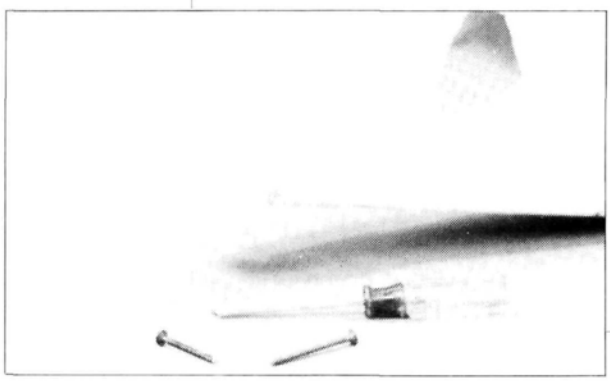
PHOTOS BY VERNON WILLIAMS

how to finish the nose of the fuselage of my new airplane.

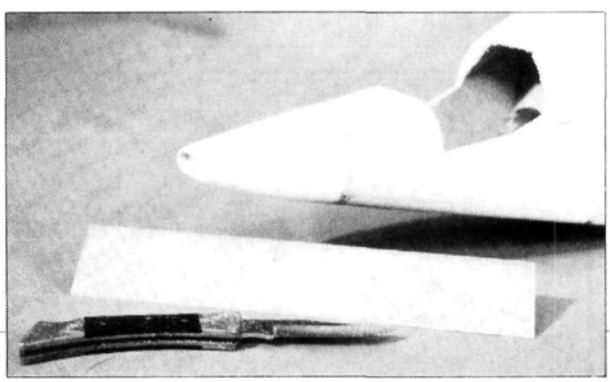
The solution:



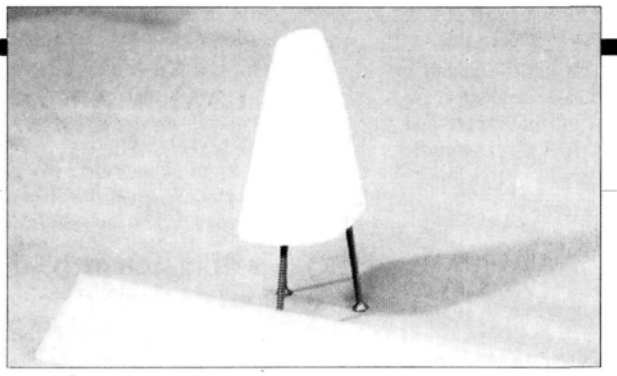
custom-make a fiberglass cowl that rivals the best made from a cowl kit.



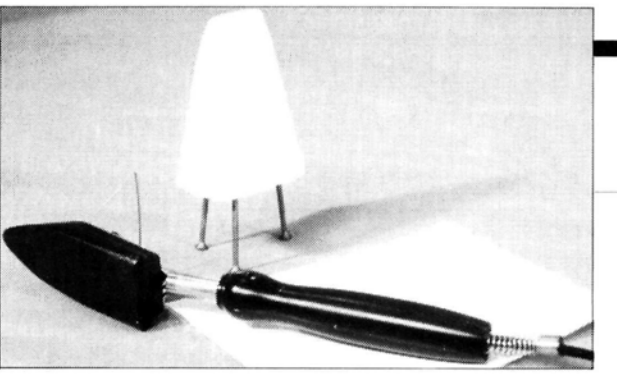
1 *Cut the foam roughly to shape, and attach it to the fuselage. The wooden piece that's attached to the front of the nose will form the air inlet. (This could be a spinner ring on a power cowling.) You can attach the foam with screws or tack-glue it.*



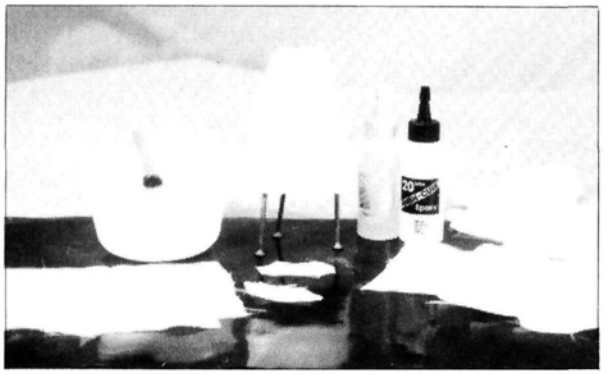
2 *Carve and sand the foam to shape. (Do this outdoors, if possible.)*



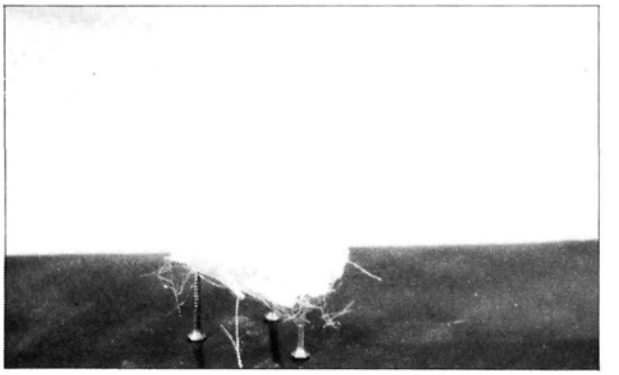
3 *Attach 3/8-inch balsa to the rear of the foam plug, and sand it to the plug's contour. This forms the part of the cowl that overlaps the fuselage. The idea is to sand the wood so that it has the same shape as the fuselage.*



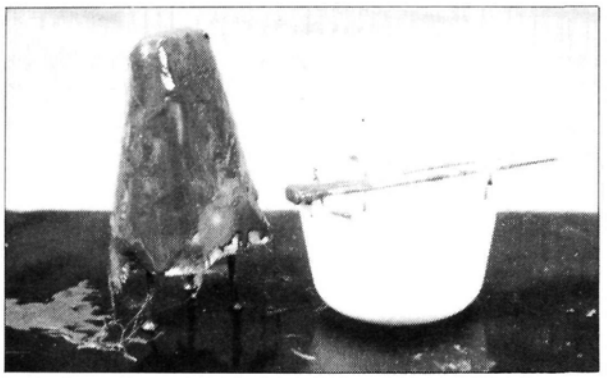
4 *Cover the plug with "low-temp" covering. When the foam has been removed, the slick covering leaves the inside with a smooth finish, and it also makes it easier to remove the foam. Note that the balsa for the air inlet isn't covered.*



5 *Rough-cut your fabric. I used one layer of 2-ounce fabric, two layers of 6-ounce fabric and a final layer of 2-ounce fabric. I only used the 2-ounce cloth over the wood in the air inlet.*

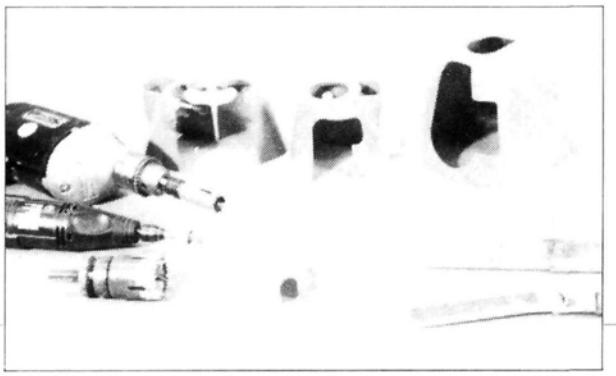


6 *Mix the epoxy resin according to instructions. Using gloves, apply the fabric and the resin to the plug. Try to stagger the overlaps, and use only enough resin to wet the fabric. Slit any puckers or air bubbles with scissors, and flatten these areas.*

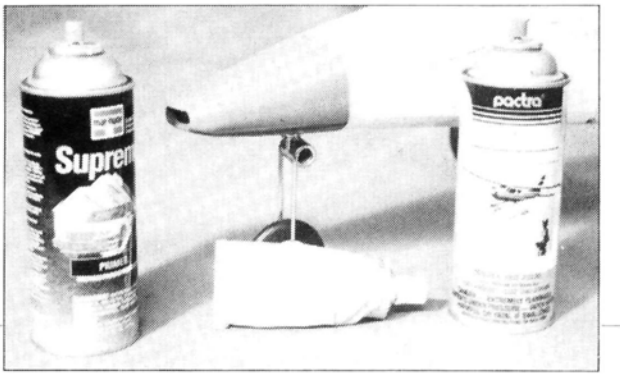


7 *Mix enough filler (e.g., talc) with the remaining resin to form a fairly thick slurry, and apply this immediately, before the fiberglass starts to cure. (Most of this will be sanded off in the next step.)*

8 *Let the resin cure for several hours. When it's fairly hard, trim the rear flange and nose opening with a sharp knife, and sand the exterior to shape. I use an auto-body hand file and 80-grit sandpaper to do most of the rough shaping, and I finish with a pad sander and 120-grit sandpaper.*



9 *I try to do any drilling that's necessary before I remove the foam. Pictured are several cowls and the tools that I used to make the cutouts. I prefer to dig out the foam. You can dissolve it with solvent, but this method is messy and exposes you to the solvent's fumes.*



10 *Prime the cowl, fill any pinholes with glazing putty, and sand with 220-grit sandpaper. Paint it with the color of your choice.* ■

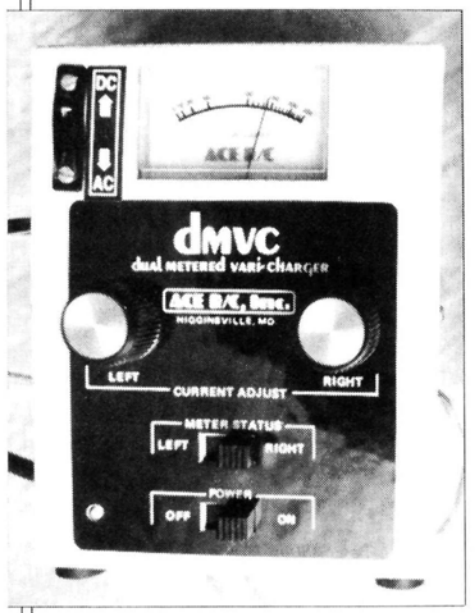
NEW PRODUCTS
TO EXTEND YOUR FLYING TIME

by MICHAEL LACHOWSKI

HIGH-TECH transmitters have multiplied our options in control-system set-up and configuration. The microprocessor added to the transmitter provides this flexibility, but it also increases demand on the batteries. Radio vendors have addressed this problem by increasing the transmitter pack's capacity from the standard 500mAh to 700mAh. This is fine if you have just one aircraft, but what if you have multiple settings stored in your transmitter, and you want to fly several airplanes? I have three receivers for my Airtronics* Vision radio, and if I use two sailplanes on one transmitter, 700mAh just isn't enough for a good day of flying.

SR Batteries* has a variety of solutions to modelers' battery needs. One of these is an external battery for transmitters. The pack, which measures 1.5x1.5x.4.5 inches and comes packaged in a rectangular aluminum case with plastic end caps, is available in two capacities—1000mAh and 1400mAh. The two-page instruction sheet has directions for mounting the pack and making the electrical connections. SR's packs don't always have to be mounted on the outside of the transmitter. The batteries will fit inside Ace's R/C Silver-7 and Micropro 8000, and J.R Propo's and Futaba's single-stick PCM transmitters, among others.

The higher capacity battery creates another problem: how do you charge it? A standard 50mA battery charger is just slightly above the C/30 trickle-charge rate of a 1400mAh battery, and it will never fully charge the battery. For normal charging, you need a C/10 charge rate of 140mA for a 1400mAh battery. Ace* has a variety of chargers, but most of them only provide the



The Ace DVMC meter shows the charging current for the battery you've selected, and the knob lets you adjust the current.

SPECIFICATIONS

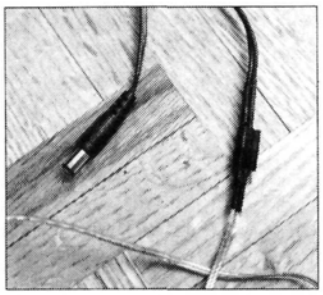
Name: SR External Piggy Back Transmitter Pack
Capacity: 1400mAh
Sug. Retail Price: $69.95
Features: This lightweight 1400mAh transmitter battery pack is mounted either on the back or the inside of the transmitter (depending on the brand and model of the transmitter). It can double or triple the transmitter's battery capacity, and it makes a good transmitter stand.
Name: DMVC Dual-Metered Vari-Charger
Sug. Retail Price: $54.95
Features: This dual-output charger can supply the high current needed to charge high-capacity transmitter and receiver packs. DC operation also makes it useful as a quick field charger.
Comments: The combination of the SR external pack and the Ace charger can extend your flying time, especially with power-hungry computer radios. The variable outputs will charge any size or com bination of packs, and it can charge two transmitters. Since installing the SR external pack, I've never had my transmitter sound a battery-power warning, even on very long days of flying several models.

The SR external battery pack (center) is mounted on a Futaba PCM transmitter (left) and on an Airtronics Vision transmitter (right).

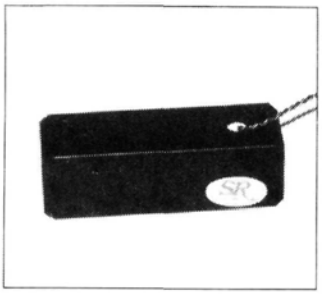
SR EXTERNAL TRANSMITTER PACK
&
ACE R/C DMVC DUAL-METERED VARI-CHARGER

high charge rate for large flight packs.

One Ace charger that can deliver the needed charging currents for a transmitter battery pack is the DMVC (Dual Metered Vari-Charger). It has a variable charge rate that can be adjusted and monitored



Charging plugs that fit different brands of radio can be attached with Deans connectors so that they can be easily changed.



The SR external battery pack case.

with a built-in meter. In addition, it can charge two battery packs as large as 2500mAh at once, and the AC/DC version can also charge packs at the field. This means that for smaller packs, you can adjust the output to the C/3 charge rate to quick-charge packs at the field.

The charger is available as a kit, but I chose the factory-assembled DVMC. It comes with a five-page operation and construction manual and a three-page supplement for the AC/DC retrofit. Another three-page data sheet on Ni-Cd batteries provides information on charging, cycling and battery care. The only work required for the assembled version is to attach connectors for your radio.

I made my charging cables interchangeable by putting a Deans* connector between the charger and the charging plug. This lets me change charging plugs so that I can charge any combination of two battery packs. One good feature of the charger is an LED that indicates you have the correct battery polarity. The LED lights when a battery is connected and the charger is turned off.

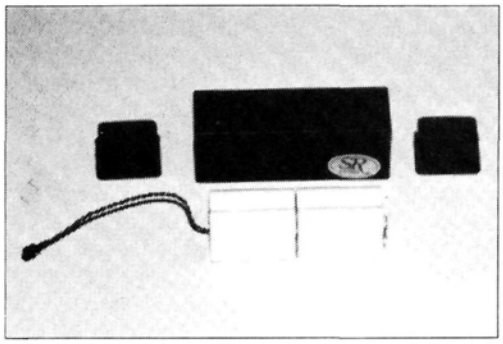
**Here are the addresses of the companies mentioned in this article:*
***Airtronics Inc.,** 11 Autry, Irvine, CA 92718.*
***SR Batteries,** P.O. Box 287, Bellport, NY 11713.*
***Ace R/C Inc.,** P.O. Box 511C, Higginsville, MO 64037.*
***Deans,** distributed by Ace R/C.* ■

BATTERY BENEFITS

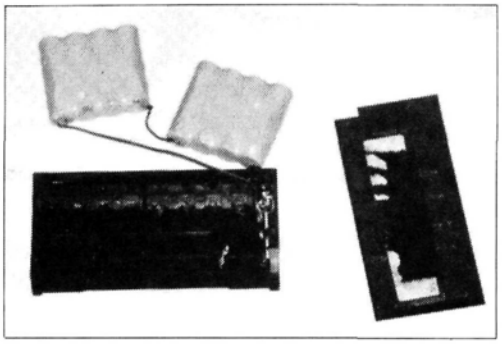
The Airtronics radio has a removable battery pack that slides onto the back of the transmitter. The external pack replaces the old battery in the transmitter, and the existing battery case is used as a mount for the new battery. Remove the existing battery cover, and pull the 700mAh cells from the transmitter case. If the cells are still good, make them into two flight packs. Connect the new pack with a mating connector and the Deans connector that comes with the battery.

To attach the new battery pack, use the template that comes with the instructions, and drill holes in the transmitter. The two small holes are for the mounting screws, and the large hole is used to run the battery wire into the transmitter's battery case. (See photo.) I set up the battery so that it would be convenient to hold the transmitter. In this position, I can stand the transmitter upright.

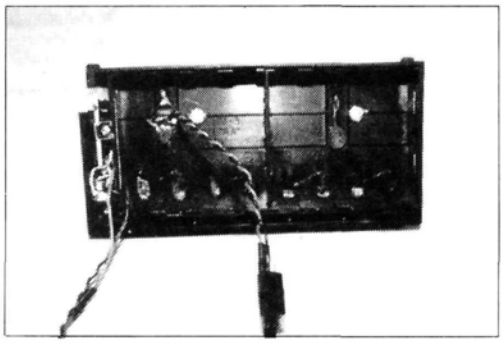
It takes less than an hour to mount the new battery and solder all the connections for the battery and the charger. I charged and cycled the battery to check its capacity, and everything was fine. If you're using an Ace battery cycler, you'll have to wait; it will take almost five hours to cycle the battery. It helps to be able to stand the transmitter up, since the Vision doesn't have a built-in transmitter stand. It's a little harder to close the cover on my transmitter case, but I won't have to worry about running out of power on a good day.



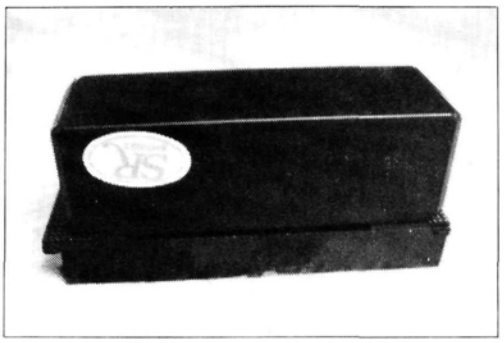
1. The components of the external pack. Remove the battery from the case when you mount the case to the transmitter.



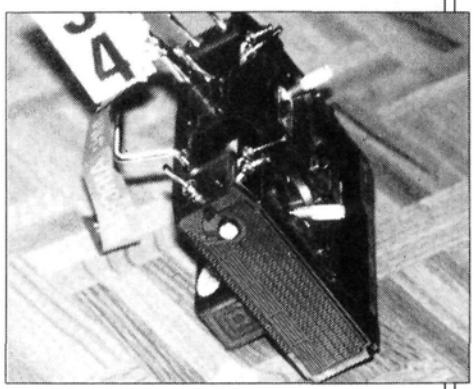
2. To mount the external pack to the Vision radio, first remove the batteries from the Vision battery case so that you can drill mounting holes.



3. Two screws hold the external pack to the Vision battery case, and a Deans connector provides the electrical connection.



4. The external pack is mounted on the Vision battery case.



The transmitter stands up when the battery pack is used as a support.

FRED'S SPECIAL

(Continued from page 66)

mance that power fliers have enjoyed for years. I hope you have as much fun with yours as Fred and I have had with ours.

**Here are the addresses of the companies mentioned in this article:*
AstroFlight Inc., *13311 Beach Ave., Marina Del Rey, CA 90292.*
Graupner; *distributed by Hobby Lobby International, 5614 Franklin Pike Cir., Brentwood, TN 37027.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
Hobby Lobby International, *see above.*
Hobbico/Great Planes Model Distributors, *P.O. Box 4021, Champaign, IL 61824.*
High Sky, *3929 Kansas St. #9, San Diego, CA 92104.*
SR Batteries Inc., *P.O. Box 287, Bellport, NY 11713.*
SPC, distributed by JH Electronics & SPC Controllers, *3403 Sellmore Dr., Mississauga, Ontario, Canada, L5C 2E1.*
MonoKote/Great Planes Model Distributors, *see above.* ■

SLOPE RACE

(Continued from page 41)

These manufacturers deserve a great deal of thanks for their foresight and generosity. Business people like these, who contribute to major events, enhance the hobby immensely for all involved.

SOUNDS OF SILENCE

In closing, the race would have to be summed up as "accelerating excitement." One only has to witness the silent velocity of these high-speed slope soarers to realize how exhilaration can build in competitors as this type of race progresses. Without a doubt, slope race pilots are skilled, competitive and enthusiastic about this form of competition within our great hobby. Their desire to be the best at what they enjoy is as intense as the desire of any other competitor competing in any hobby or sport.

If you're interested in this form of racing, or just in racing in general, I welcome a call or letter (Wil Byers, Rte. 4, P.O. Box 9544, W. Richland, WA 99352; [509] 627-5224). Hope to see you at a slope race some time in the future. ■

P-51D

(Continued from page 64)

scheme that uses a white spinner is that of the 354 fighter group of the 9th Air Force. This version sports a plain tail with black numbers and invasion

(Continued on page 82)

SPORTY SCALE

TECHNIQUES

by FRANK TIANO

A colorful look at weathering and engines

Wayne Siewert's KI-84 from Don Smith Plans is a study in weathering and panel-line detail. The 88-inch span, 32-pound "Frank" is powered by a Sachs 4.2.

AS PROMISED, this month's topics will include some basic techniques on how to panel-line and weather your airplane. Also, I'll be previewing some new gizmos as well as reintroducing you to a line of fine gas-powered engines that we may have been overlooking lately.

PANEL DISCUSSION

Panel lines on a scale airplane can often be the one little thing that sets a particular model above the rest. Regardless of how they're applied, they add just the right degree of realism to minimize the "toy" effect and maximize the "real" effect. You can apply the most simple panel lines with a pen.

Bob Violett's personal F-86 shows airbrush weathering and inked panel lines. Note that the gun's blast tubes are dirty brown, not black.

Now, before you all speed on down to the Office Depot for a fistful of Bics, let me explain what kind of pens are needed. Unless you have access to a set of Rapidograph pens (like the ones offered by Koh-I-Noor), the best pen to use for inking panel lines is the Sharpie permanent marker produced by Sanford. You'll want the one with an ultra-fine point. Black is usually the color of choice, but you can sometimes find a charcoal or dull silver pen that looks good, too. One thing to remember: *never, never,* use a red pen of any type when you're building your model. Red ink will continue to bleed through even the best paint job for the rest of your life!

Anyway, with your marking pens in your inventory, here's all you do. From your three-view drawing, plot out and draw the panel lines on the model with a pencil. Next, get a flexible ruler, place some pads of masking tape on the back, lay the ruler along the pencil lines and draw the ink lines. The pads keep the ruler ever so slightly off the surface, so the ink won't drag as you remove the ruler. When you've finished, dust on a light coat of clear paint (gloss or flat), and the lines are part of the model forever!

A more complex way to make panel lines is to actually place them in or on the model's finish. While this takes a lot more time, the effect is astounding. Most competition builders use this method for maximum realism. The procedure is simple in concept but somewhat time consuming. When the model is ready for its first coat of paint, you must dust on a very light coat of the base color. If the airplane is a camouflaged brown and green on top and light blue on the bottom, dust on a coat of green on the top and blue on the bottom. Next, lay out the panel lines in pencil as explained before; then, go to any art-supply store and purchase some Mylar drafting tape.

Silent Spark offers a slower idle and more reliable throttle response with no loss of power. Al Diem offers custom installation; just send your engine and the dough.

(Chartpak is a popular brand). This tape comes in a variety of widths, so get the one that best approximates the panel divisions on your airplane. On a typical 80-inch airplane, something less than 1/32 inch is about right. Also, get the crepe type; it goes around curves a little better. Lay the tape down over the penciled lines on the entire model. If the tape seems to lift off the surface a lot, it probably means that you didn't remove all the sanding dust; go get a tack-rag!

When the entire airplane is full of paneling lines, you can finish in one of two ways. The easiest way is simply to paint the airplane. The paint will seal the Mylar drafting tape and prevent it from lifting. The harder way is to spray several light coats of paint onto each side of the panel lines, remove the tape, and then paint the entire model. The result will be indented panel lines that are a little more realistic.

WEATHER WISE

Weathering a model takes a little practice and a lot of technique. For years, many of us simply put thinned black paint in an airbrush and streaked the model around the exhaust outlets, machine guns and major panel lines. Though that may have been the "trick" procedure in the '70s, it's a bit too much nowadays. Try using soft paint colors for weathering. Try browns and grays around exhaust stacks; beige and charcoal around panel lines and machine gun troughs; and several shades of brown for general streaking. Remember that you're trying to "dirty-up" the airplane, and dirt is *not* jet black! Also keep in mind that an over-weathered model will look like a toy. Less is best! Some guys use silver Rub and Buff for weathering or "depicting" worn panels. While an interesting effect can be achieved by showing bare aluminum coming through a paint job, you must still go easy with the application.

The Professor (Don Smith), your author and our Top Gun team entry—a Henschel 129. Don, an architect and an accomplished artist, uses special pastels, and weathers the airplane before every contest. Eventually the wind blows all the pastel chalk off!!

This DH89 Rapide belongs to Richard Crapp. The weathering uses the older, black, airbrushed technique to good advantage. There's a very fine line between "just right" and "overdone" with this method. Something like perfectly cooking a juicy steak on the barbie!

SERVICE, PLEASE

From the amount of mail I've received, it's pretty obvious that some of you are a little disenchanted with the service—or should I say *lack* of service—given to you from one or two gas-engine companies. Well, it may please you to know that I, too, have had these problems, and because of them, I went off and did a little investigating. Here's what I've found. First, most gas engines perform about the same. Wow, what a statement! Let me explain. Take several 3ci engines; they'll all turn the same size prop within 500rpm of one another. Unless you're purchasing a full-blown racing version, that's a simple fact. Now, though 500rpm may seem like a lot, it's really not. For instance, the difference in mph in 500rpm on a 18x10 prop running in the 7,000rpm range is something like 5mph! And that's a mathematical fact, too. So, stop worrying about the optimum rpm factor and start considering the reliability and serviceability factor. That's what I did.

QUADRA QUALITY

I've just become re-acquainted with the Quadra line of engines. No, not the bulky, hard-to-start, underpowered engine of 17 years ago; but rather the streamlined, easy-to-start, powerful—and good-looking, I might add—engines of today. Quadra engines are now marketed by Aerrow Inc*., under the direction of Klaus Nowak. Klaus has really done a great job in perfecting the Quadra in all of its many forms. Though the very first Quadra was indeed a chain-saw engine that was converted to model aircraft use, this new breed was designed from scratch for model use; hence the high degree of quality and power.

Right now, Aerrow produces a Q Series engine in the 35cc, 42cc, 52cc and 100cc single-cylinder design. Their ultimate piece of art is the Aerrow 2x50 (a clever mating of two 50cc engines to produce a 100cc twin-cylinder engine that displaces 6.38ci and develops a little over 8hp!). I installed a Q50 in my Byron P-51 and I got to tell ya, I really like it. I imagine that the guys over at Byron must like them a lot, too, since all their airplanes are designed around one Quadra or another! Aerrow markets their fine line of engines here in the U.S. through several distributors (US Quadra* is one of them), so you can easily get one through your favorite hobby shop. They also produce several informative flyers that you can get at your hobby shop too. If you simply can't find these flyers, just mail $1 to Aerrow, or send a large SASE to US Quadra, and they'll help you out.

Mel Whitley's Top Gun-winning Sea Fury uses the "removed-tape" method of making panel lines. Instead of drafting tape, Mel uses hand-cut 3M premium masking tape because it peels off the base coat easier.

SPECIAL PLANS

Last month we talked a little about scratch-

(Continued on page 83)

P-51D

(Continued from page 79)

stripes—a quick and easy-to-duplicate scheme. The trim was easy to make because the templates for the trim sheet were provided on the back of the plans; so don't cut them up!

FINAL ASSEMBLY

I attached the scale exhaust stacks and the canopy with CA and Zap-a-Dap-a-Goo. Both caused the plastic film to wrinkle, but I smoothed it easily with a pass of the MonoKote iron. After I had taped the inside of the canopy (I used 3M trim tape; you could also use black electrical tape), I painted the inside of the frame with silver Pactra* R/C car paint. This tough paint is used on Lexan car bodies and it will "take a licking and keep on ticking." It sticks well, and you won't see any brush marks.

I covered the fuselage and tail feathers first, and I left the canopy attachment to dry overnight so it wouldn't get scratched or damaged during the radio installation. This also allowed Richard to install the tank, radio and servos while I covered the wing and installed the landing gear and wheel doors.

(Continued on page 87)

SPORTY SCALE

(Continued from page 81)

building. Well, for all of you who would like to scratch-build a special airplane but find that absolutely no plans exist for it, I have some wonderful (though maybe a bit costly) news. For a brief period, Don Smith—of Don Smith Plans*—will design a complete single-engine model airplane, up to 100 inches of span, with all bulkheads and formers shown; no instructions, just plans. So if you've been longing for an 80-inch Douglas Dauntless, an 82-inch Hurricane or an 88-inch Beech Bonanza for your very own, you can now have one. You get full-size drawings showing every single part. All ribs and bulkheads show the appropriate spar and longeron cutouts as well as landing-gear locations. They *don't* include instructions. And you'll have to make your own canopy as well. The price? Just a mere $600. Need a twin, you say? A little more, sure, but he's willing to do it!

CHUCK'S CUSTOM CUTS

If 600 bucks is a little steep for you right now, and you'd like to build something from plans but don't have the time to cut out parts and stuff, Chuck Gill can come to your rescue. Chuck has recently formed a new company, The Aeroplane Works*, that offers custom-cut kits of all the Nick Ziroli designs. A large SASE will get you all the details, but for now, here's an example: a Ziroli P-40, Bearcat, or AT-6 kit can be purchased for as little as $275. You supply the plans, or pay a little extra. Just remember, if you like scratch-building but hate cutting out all those parts, Gill will!

SILENT SPARKS

My friend Jim Manoli has told me for a couple of years now about the advantages of putting an ignition system on large glow or 4-stroke engines. He says he gets easier starts, a lower idle and more dependable running without a loss in power. I said, "Baloney." He said, "Try it." I did, and he was right. I sent my new Super Tigre 4500 and my O.S. 3500 out to Al Diem at Tran-Sil, and he did quite a job on both engines.

This is probably the way to go, especially in a twin, if you have to use glow fuel. Best of all, you really don't have to use nitro if you don't want to! And right now, that's quite a bonus. One dollar will get you all the information you need. After a lengthy conversation with Al, I decided that reliability really was the most important part of competition flying, and anything that increases reliability is definitely for me!

All Aerrow Quadras feature easy starting, and all but one have the rearward facing spark plug. Easy starting, easy service and easy installation. Available nationwide; no waiting!

This Silent Spark* unit that Al sells offers a lot more than just reliable performance; it also tames any engine that has the tendency or audacity to kick back and cut the beegeezus out of your knuckles. You see, by using a spark plug and timed ignition, the time when the spark plug fires is controlled by the unit; it's not on all the time like a glow plug. Best of all, the timing setup is easily changed for different prop, fuel or altitude conditions. A few of the guys around here are running their big Tigres on Al's unit, but on gasoline! Talk about saving money!

PICTURE THIS

A neat gizmo I think every modeler should have is being produced by Bob Monahan of Wings and Things of Time*. It's a great concept: a photograph of you, your model, or both on a walnut plaque with an inexpensive but attractive clock off to one side, and a durable clear coat to protect everything from aging or scratching. I have one in my office; it's quite attractive, tells the proper time, and it's a neat conversation piece. And because the clock runs for about 2 years on a standard battery, there are no unsightly electrical cords to deal with. Bob offers desktop or wall clocks in sizes of 5x7 and 8x10 inches. Talk about a great gift idea! Once again, a large SASE will get you more details and prices.

WAR STORIES

While I was in the Chicago area a few weeks ago, I discovered a place hidden away in Skokie that deals exclusively with military books of all kinds. I called one of the owners and asked if he had any inventory of airplane books, and he advised me that he had quite a collection of new and old books and magazines. The name of the shop is "Articles of War Ltd.*," and it's owned and operated by Bob and Judy Ruman. The pitch is direct and simple. If you need a book or magazine containing information on a specific airplane, and you can't

(Continued on page 102)

GOLDEN AGE

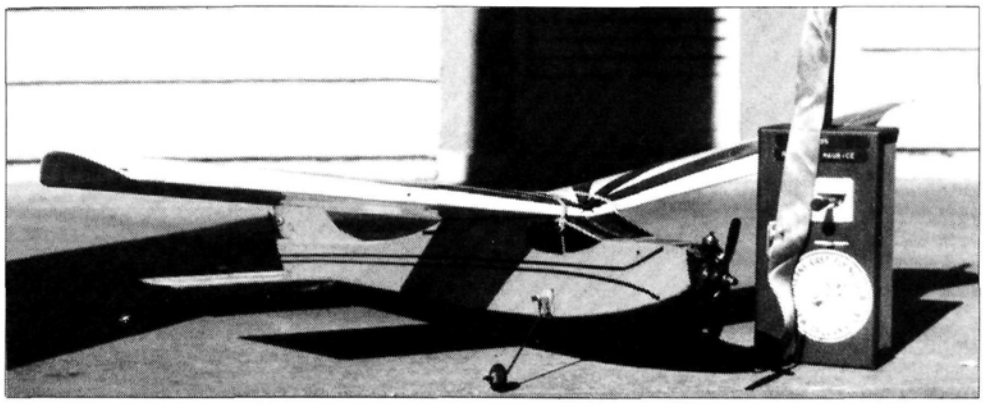
OF RADIO CONTROL

by HAL DEBOLT

Old friends forever fly

THIS MONTH, it's *your* turn to take the podium —for the most part.

I recently featured a mystery model, hoping someone would know its origin. Unfortunately, no one seems to know, but I did receive a nice letter from the R/Cer who initially sent the photograph of it. Raoul Maurice of New Orleans, LA, explains that he is no modeling "spring chicken," because he started in 1936. These days, he's into the gentler flying types, e.g., a 7-foot OT FF Megow Quaker, which is powered by an ST .46 and does well with three channels. A man who enjoys diversity, he goes to the other extreme with a Cox .010-powered Top Flite School Boy. Remember that the School Boy is one of the many small R/Cs developed by Ken Willard. Raoul says it does quite well with the OT single-channel Ace pulse system—a true OTer; right? Someone mentioned that Ace R/C can still supply its pulse system—30 years later! Interested? Contact Steve Kaluf at Ace*.



Raoul Maurice's vintage .010-powered Top Flite School Boy, which he flies with an Ace R/C OT pulse system.

Accomplished modeler and artist Calhoun Smith launches his R/C plane at a mid-'50s Nats.

THEY DID IT *THEIR* WAY!

I've often said that you never know what you'll find buried on dusty shelves and in long-ignored drawers. An example comes from my good friend Henry Thomas of Little Rock, AR. Cleaning his workshop, he found OT photos at the bottom of a box and thought you'd enjoy seeing them. One photo shows Calhoun Smith hand-launching one of his many R/C designs at a '50s Nats. Cal Smith was a great modeler and designer who left us much too soon; it's hard to believe he died more than 25 years ago!

For years, his prolific control-line, free-flight and R/C creations were featured regularly in modeling magazines, and he was equally well-known as an aviation artist. His paintings graced the covers of model magazines, while, on the pages inside, his illustrations helped us to understand the mysteries of our gadgets. Cal's exquisite art was also seen in publications dealing with full-scale aviation, and he was an accomplished pilot, both R/C and full-scale.

Another photo shows master modeler Jim Walker at a late '40s Nats. What can I say about big Jim that hasn't already been said? We know that Jim was an early R/Cer, so he had to suffer the limitations of single channel, etc., just like the rest of us. Always an innovator, he did come up with some clever discriminators and actuators, which others used on *their* models. Jim's R/C systems seldom contained an "off-the-shelf" item. He simply did it his way!

These are examples of Cal Smith's magazine art. It's too bad they aren't shown in their original brilliant colors.

The Babcock 5-channel drone receiver.

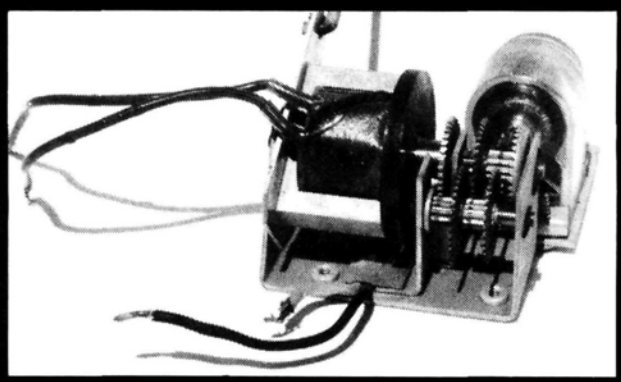
more on BABCOCK DRONES

Jack Albrecht has been involved with R/C in one way or another since the earliest days, and he's now customer relations manager at Airtronics. He noted my recent discussion of Babcock and offered more information about the company's involvement with drones. He says the regular U.S. Army target drones were ultra-expensive RCAT aircraft that were capable of 200mph on 72hp and stabilized by gyros. The National Guard wanted something much less expensive, so Babcock supplied the "R-Kitty" drone.

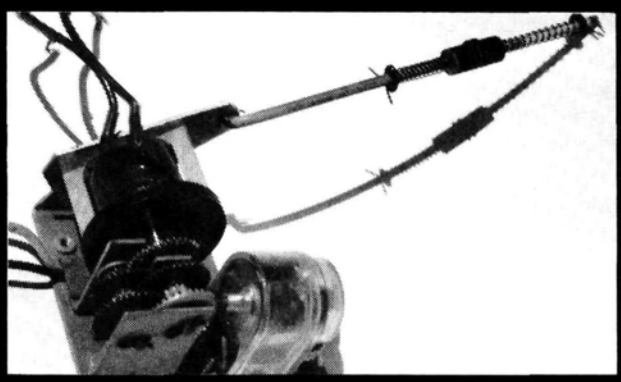
Designed by Dick Schumacher, the R-Kitty was powered by a Fox .59 and controlled by a typical Babcock radio, which was audio filtered to provide 5-channel operation with rudder, elevator and engine control. What was fundamentally the same concept provided R/Cers with the BCR-3 model.

Particularly interesting were its unique servos. The motor seems to have had the same origin as the type used with Dmeco's multi-servos—namely, the toy industry. The Babcock servo's motor, however, ran *continuously* and revolved a large iron disk that a magnetic clutch could engage. A specific tone made the clutch engage the disk, and the motor power advanced the output arm to the position associated with that signal. On the cessation of the command, springs returned the control to neutral. That required one radio channel. A second channel signal caused the same action in the opposite direction. This resembled "reed" operation—a separate "code-tone" for each control direction. The control moved to its extreme; there was no proportional or trim function.

The receiver was a typically robust Babcock concept. An unusual feature was that the sealed relays and tubes could simply be plugged into sockets (no adjustments) and held by springs, which you can see in the photo. They sure didn't want anything to fall out in flight!



The Babcock drone servo. Note the large, iron, rotating disk, which was engaged by a magnetic clutch.



Note: the springs in the pushrod neutralize the drone's servo.

As the photo shows, Jim's models looked utilitarian—always big, .60 powered and robust! Only seldom was there anything fancy. His planes' wings often seemed to be attached to the fuselage as an afterthought, because he made no attempt to "blend" the wing mount into the fuselage. Note the circular fin decal with the number 27. This showed that the radio was on the license-free "Citizens' Band." Other colors and numbers designated the 465 and ham-radio bands. During the late '40s, Jim did well, winning the Nats several times. I was interested to see that, on the back of one of the photos he sent, information about the models is in *my* handwriting! This shows how far back our friendship goes; I must have sent it to him in the early '50s.

PYLON PURSUIT

Early on, George Swank and I thought that there was a place in R/C for racing—some sort of pylon event. Nothing official had been established, so we decided to explore the possibilities. We used different

(Continued on page 86)

GOLDEN AGE

(Continued from page 85)

The late great Jim Walker with his '40s Nats winner.

frequencies so that we could race against each other. (George was on 27 megacycles, and I used 465.)

We first thought that the models should look like racers; they should have a cowled engine and sleek lines instead of the cabin and free-flight style of the time. We laid out a shoulder-wing configuration in two sizes to see which size would best suit racing. Both models had low landing gear to reduce drag, and the nose wheel of the trike version was half buried in the engine cowl. George chose to build the smaller version, leaving the larger one to me.

The smaller plane—the "No. 3"—had a 500-square-inch wing and a fuselage that was designed to *just* enclose the radio equipment. Weighing approximately 4 1/2 pounds, it was powered by an Elfin .15 diesel, and its symmetrical airfoil was most unusual for the time. My 5-pound version had an 850-square-inch wing with a flat-bottom airfoil and was powered by a Thorp 19. Unfortunately, all that came of this project was the discovery that, for rudder-only flying, a shoulder-wing configuration wasn't worth a darn!

On the No. 3's first flight, George fought a spiraling tendency until the engine quit. Without power, the racer immediately went into a spiral dive that George couldn't counteract with the rudder, and the crash completely demolished his hopes for it.

The larger version's first flight was more successful. Under power, it responded to rudder as we expected. It seemed quite fast compared with other R/Cs, and it even *looked* racy as it buzzed by. With a dead engine on a landing approach, it, too, entered a spiral turn that wouldn't respond to rudder. Fortunately, however, the spiral was flat, and the plane was only slightly damaged when it hit the ground. Having had similar problems with both versions, we made a complete check of the R/C system, even test-flying it in another model. After that, we tried again, but with the same result as before.

Obviously, we didn't accomplish our goal, but we did learn which model configuration *not* to use with rudder only! We also saw enough to make us want R/C racing.

Eventually, I raised the wing on mine by about 2 inches to give it a low-cabin configuration. With that, the model was as docile as a kitten, and I enjoyed much fine flying for years with it. With today's equipment, I'm sure that both of these racers would have been successful. But that's the way it was then!

RECORD SETTERS?

In response to my request for information on Pro-Line and E-K, Roy Parks of McAllen, TX, wrote to say he couldn't find the material he thought he had, but his memories are interesting. In '67, he bought an E-K system with the big red box receiver and three matchbox-size servos. In '73, he updated the system with the much smaller E-K III receiver and servos, and he flew it for many hours without a problem until he sold it in '80. He kept one of the matchbox-size servos as a memento of what we once used. Roy also says he has a '75 Pro-Line radio that still works well in a Wankle-powered RCM Trainer 40. Like so many others, Roy says his Pro-Line has been trouble-free.

Early '50s prototype R/C racers made by George Swank and Hal deBolt.

Old-timer Frank Madl of Des Plains, IL, checked in with some of the information I've been searching for. Interested in the hobby since the '40s, Frank must have been an R/C pioneer. In those early days, Frank was noted for his Custom Cavalier, which he initially campaigned with a Good Brothers system. I seem to remember that this plane went on for years, with a multitude of R/C systems. Frank must be a real "pack rat," as his inventory of OT R/C gear seems endless. He can also claim to be the first to use a coiled-spring nose gear—on his Cavalier in '57. "Flying Models" magazine gave him $5 for his invention and published details of it.

Finally, does anyone have information on the Detroit Invitational Meets of the late '50s and '60s? The events were very similar to today's Tournament of Champions in Las Vegas, NV, and they went a long way toward building the prestige of R/C. We need photos, experiences and written material. How about it? Do you have anything?

That's about it for this time. Perhaps I'll hear from you soon?

**Here's the address of the company mentioned in this article:*

Ace R/C Inc., *116 W. 119th St., P.O. Box 511C, Higginsville, MO 64037.* ■

P-51D

(Continued from page 82)

I used Robart* struts over the 5-32 gear to give them a more scale-like appearance. You'll have to use the 2 1/2-inch or 2 3/4-inch wheel if you use retracts, but I elected to use 4-inch Robart P-51 scale wheels for better handling on rough grass and for better appearance. These wheels sit further ahead of the CG, and they help avoid nose-over landings on a grass field. For scale purposes, the model sits too close to the ground, so you may want to bend a new set of landing gear and use an offset landing-gear yoke. For best static points in stand-off judging, use a paddle-blade-type P-51 propeller. I use an old B&D* aircraft prop kit that was produced as a static prop. Using cut-down "flying" props is an expensive waste of good props.

RADIO INSTALLATION

We use a Futaba* PCM 7-channel radio, but any name-brand, gold-sticker receiver unit will do. There's plenty of room to install it, and all the angles for the pushrods and servos are worked out on the plans. We use a Du-Bro* ball

(Continued on page 90)

QUIET FLIGHT

BITS FROM BRITAIN

by JOHN LUPPERGER

I WAS LOOKING through some old magazines and newsletters from England when I realized that our friends across the pond do things differently. It's interesting how they've approached the same problems and come up with different solutions.

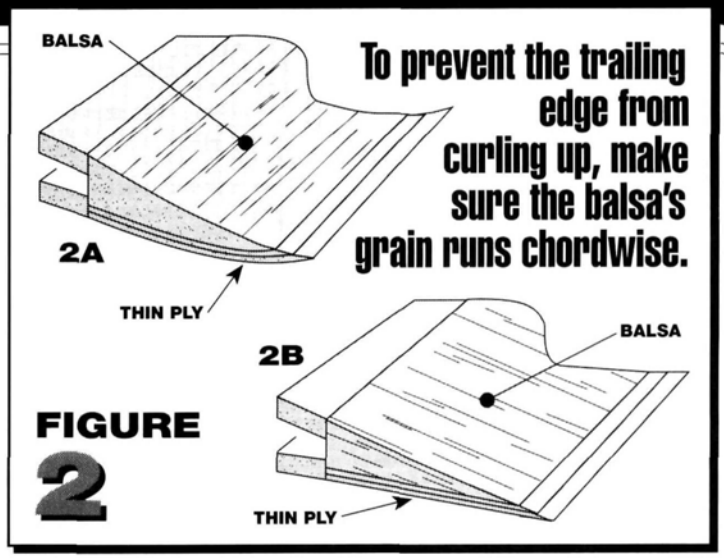
The "White Sheet" newsletter (similar to our "Soaring Digest") is the most popular one printed in England. For longer than most of us can remember, Sean Walbank has been editing this soaring masterpiece. I met Sean at last year's World Interglide meet in England and was able to beg my way onto the "White Sheet" mailing list. Sean compiles contributed info, magazine articles, blurbs from other newsletters and his own knowledge just for glider guiders. I've selected a few items from the last few issues for your edification.

AILERON ERROR

This piece comes from the BARCS newsletter and was written by Bernie Henwood. Like Americans, the British are starting to fly more multi-task-style models with ailerons. Most of us simply cut out the ailerons with a table saw or a band saw and then cut or sand an angle in the moving surface. Wrong! Read on and you'll learn how to do this job correctly.

"It's quite common to see top-hinged ailerons with only the aileron leading edge angled to allow for movement (Figure 1A). When an aileron arranged like this is deflected downward, a step is created in the underside of the airfoil (Figure 1B). This creates extra drag and increases adverse yaw. It also lifts off any tape or Mylar that was applied to seal the hinge gap. The aileron and wing trailing edges should be angled equally so that the depth of the mating surface will be the same (Figure 1C). If this is done, the aileron will match the wing trailing edge exactly when deflected (Figure 1D). Alternatively, the wing trailing edge can be angled so that it has a slightly deeper face, which will allow the sealing tape or Mylar strip to blend across the gap in a smooth curve when the aileron is deflected (Figure 1E)."

I didn't know about the drag or adverse yaw created by the hinge line in this situation. I've even seen some high-tech glass-bagged wing models with the ailerons done "improperly." It's a real shame to spend all that time trying to build perfect wings and then neglect something that's so simple to correct.



To prevent the trailing edge from curling up, make sure the balsa's grain runs chordwise.

FIGURE 2

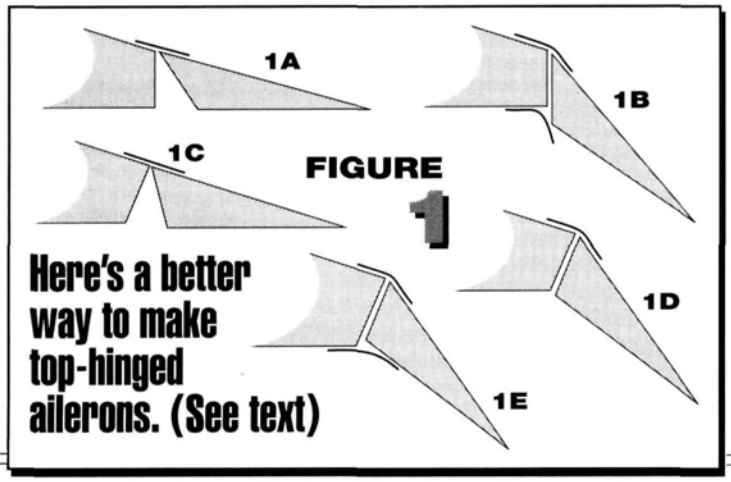


FIGURE 1

Here's a better way to make top-hinged ailerons. (See text)

TRAILING-EDGE TIP

Another tip from Bernie Henwood, this time from the Sheffield S.A. newsletter, concerns "built-up" trailing edges. I've always found it a pain-in-the-you-know-what to get a relatively straight trailing edge with this type of construction. When I saw this tip, it was definitely a case of, "Why didn't I think of that?"!

"Built-up trailing edges are often produced by laminating a strip of balsa onto a piece of thin ply in order to achieve the thin, sharp trailing edge that many soaring sections require. Usually, this is done with the grain of the balsa running spanwise (Figure 2A). A fault of this form of construction is that the trailing edge can curl up, especially if water-based glues are used, or a shrinking dope finish is applied. A way of countering this tendency is to apply the balsa with the grain running chordwise (Figure 2B)."

That seems like a very simple, effective way to

straighten those built-up trailing edges. I suggest that you use a 4- or 6-inch-wide sheet to cut down on the number of surface glue joints that might cause difficulties with final sanding.

CLEAN, ALL-MOVING T-TAIL

T-tails have enjoyed a renewed popularity in the past few years, and in Europe, almost every performance-oriented model has one. There are many methods of attachment and actuation, but this is the cleanest setup I've seen. It comes from Alan and Mark Sickling's Excalibur design, and was written up by Bernie Henwood in the "Soarer" newsletter.

"One reason for using the T-tail arrangement is to cut down interference drag at the intersection between the fin and the tailplane. However, exposed linkages or chunks of fin sticking out above the tailplane often negate any drag reduction that might have been achieved by using the T-tail layout. On the Excalibur, a fairly thick symmetrical tailplane section is used (this has both structural and aerodynamic advantages), and the top of the fin is shaped to accommodate the movement of the tailplane and is shrouded within the thickness of the tailplane (Figure 3A). The top tailplane skins meet on the center line and are taped together to secure the two tailplane halves (Figure 3B)."

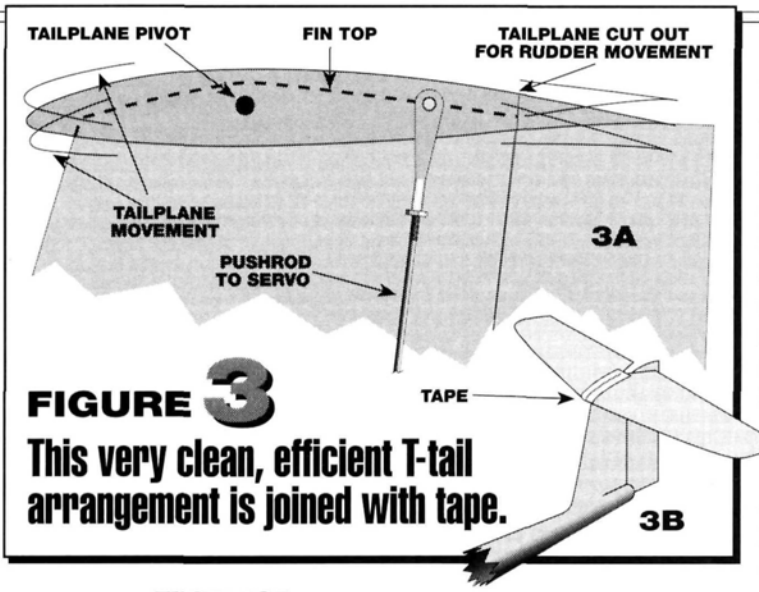


FIGURE 3
This very clean, efficient T-tail arrangement is joined with tape.

FUSELAGE BALLASTING SYSTEM

Once more, from the prolific pen of Bernie Henwood and the Sheffield S.A. newsletter, comes a great tip on ballasting the newer nose-cone, sheath-type fuselages. Many of these ships use bolt-on wings with thin airfoils. This makes it much more difficult to put ballast tubes in the wing; a logical alternative is fuselage-mounted ballast.

"Bill and Steve Haley are well-known [British] duration thermal soaring and F3B fliers and designers. Their new glass fuselage, designed for F3B models, includes the very neat ballasting system illustrated here (Figure 4). The system is very similar to that used by Robin Woodhead of the Rolls Royce Club in his rolled-ply fuselage design, but the use of fiberglass allows the system to be more completely integrated into the fuselage structure.

"The fuselage is designed for bolt-on wings and has a slide-on, sheath-type nose cone to cover a conventional nose housing the radio gear. The ballast is housed in two tubes that run down either side of the fuselage from the radio bay and under the wing seat. To load the ballast, remove the nose cone and slide the weights in through the cutaway front portion of each tube. Then, secure it by fitting wooden dowels into the open front part of the tubes, and secure these by sliding on the nose cone. The system is easy to load and unload, minimizes adverse effects on handling by keeping the ballast as close as possible to the CG and provides a seating for the servo mounting. The tubes also add considerable strength to the sides of the radio bay and where the fuselage is cut away for the wing. Altogether, a very elegant piece of design!"

This *is* a neat way of ballasting, and I really like that it strengthens the fuselage at the same time. You could also use wooden dowels first, then the lead slugs, then wooden dowels; this would allow you to ballast and change your model's CG for different wind conditions.

In the next issue, I'll have some pictures and words on the dangerous direction that, in my opinion, glider skids are taking. (I promised you these a couple of months ago, but I lost the pictures!) I'll also profile a British competition F3J model to give you an idea of what type of model suits the new FAI thermal event.

Till next time, good thermals and full charge! ■

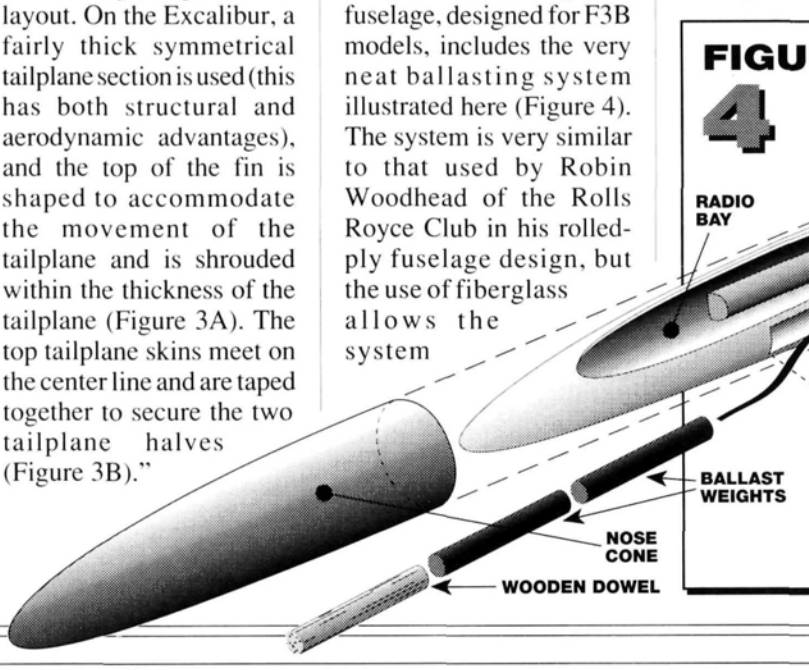


FIGURE 4
Here's a novel way to install ballast weight in the fuselage under a thin, bolt-on wing. This system also strengthens the fuselage.

P-51D

(Continued from page 87)

connector for the throttle and it works well. The E-Z* connection to the solid 1/16-inch wire pushrod ends makes the pushrod installation quicker.

PERFORMANCE

Well, it was Sunday, and after two days of building, we were ready to fly the P-51. If you don't have any tail-dragger experience, ask another experienced modeler to help you for the first few times. If you mount the tail wheel on a straight line below the hinge line of the rudder and don't bend the tail-wheel wire toward the rear, you'll avoid a lot of the common tail-dragger oversteering problems.

We made sure that the CG location gave a slight nose-down attitude in the model, and then we were ready to fly. We had to move the battery pack to a place under the tank in the nose to make the P-51D balance, but that's better than putting lead in the nose! If you like an airplane that does snap-rolls and might also do ground loops on takeoff, leave it tail-heavy!

I recommend a .45 or .50 engine for the best all-around performance, because this is a bigger .40 plane than most, and it has a thicker airfoil. We installed an old O.S. max .30, and its performance was marginal.

The plane flew right off the building board with only a slight down-trim needed. It's stable and will do every maneuver you can think of. Landings were smooth, and you can fly it as slowly as you want to because it has no tendency to fall off on a wing. We used the surface movements shown on the plan, but we went to more throw in subsequent flights. Now, after 10 flights, we haven't even scraped a wing tip!

KIT MODIFICATIONS

You can make the plane more scale-like if you glue the full-span aileron strips to the wing and then cut the ailerons and flaps from the wing. You can have a lighter stabilizer and rudder if you use a built-up version and cover it with 1/16-inch sheeting instead of using the supplied 1/4-inch slab stab and rudder. If you use a balsa block on the nose instead of the plastic cowl, it will work very well.

(Continued on page 102)

C O N T E N T S

HELICOPTER SECTION

94 Rotary-Wing Roundup

96 Helicopter Challenge
by Craig Hath

99 Radio Review: Kyosho Series Advance 6FM-H
by Paul Tradelius

In this issue, see Paul Tradelius's review of Kyosho's new 6-channel FM helicopter radio. Craig Hath continues his series on aerobatics; this installment covers inverted flight, with pointers on switched and switchless approaches.

Above photo: The Bell Model 47D was the world's first licensed helicopter. It featured a convertible cockpit that could be operated either completely enclosed (as shown), or with the upper glass and the doors removed.

ROTARY-WING ROUNDUP

ALTECH MARKETING
Jess Heli Body

If you're tired of Jet Ranger bodies, Altech/Hirobo offers a body that resembles the Jet Ranger but is shaped and styled for better aerodynamics and good looks. This fiberglass masterpiece fits the SST-Eagle and SST-Condor machines.

Price: $430

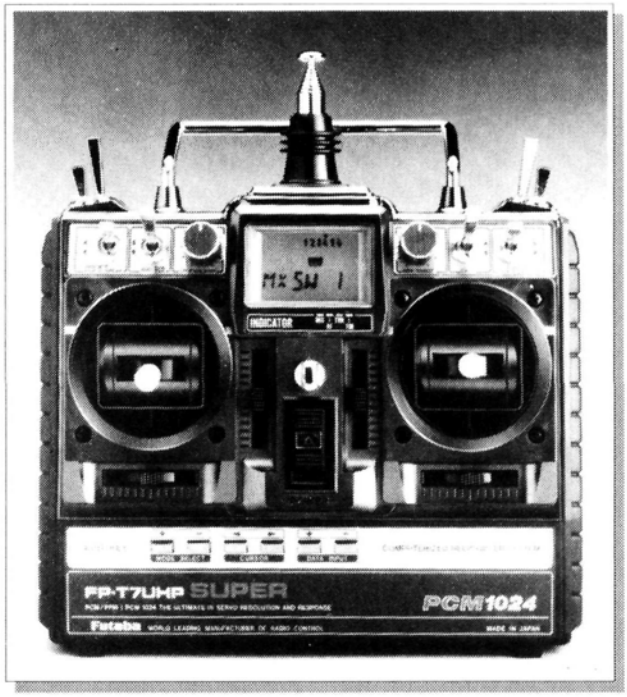
Part no. 0404-931

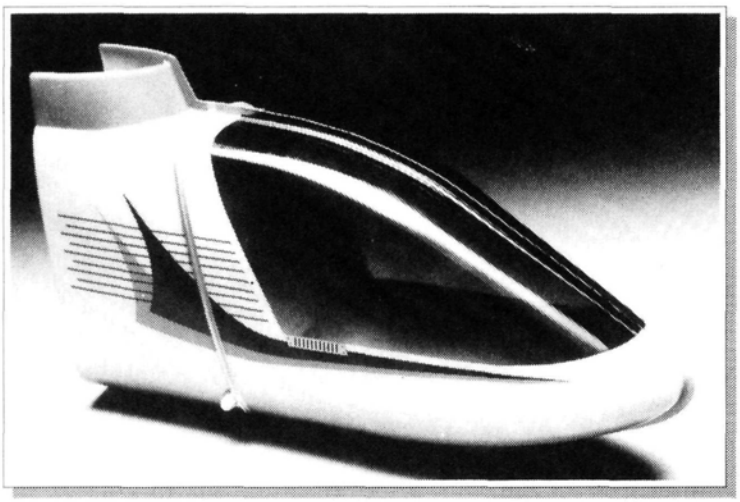
For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818; (201) 248-8738.

FUTABA
7UHPS Heli Super System

Futaba's FP-T7UHP 7-channel PCM1024 radio system includes: R129DP/PCM1024 receiver; five S5101 servos; 1000mAh Ni-Cd power pack; four-model memory with helicopter, glider and aircraft software; LCD computer screen; ATV (seven); dual rates (three); programmable mixing; CCPM mix; idle-up; timer; invert; servo-reversing; plug-in radio-frequency module; trainer system. It operates on 50 and 72MHz.

For more information, contact Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.





HEL-x CORP.
Yale Vacuform Canopy

Hel-x Corp.'s new Yale vacu-formed canopy for the Schluter Champion has been painted *inside* with candy green (below) and candy blue (topside), and it has red, yellow, and blue speed graphics on a brilliant white background. Because of the painting technique used, the colors have depth and brilliance. The canopy's lightly tinted windscreen allows the operator to see the R/C LED indicators.

Price: $179

Part no: 1079

For more information, contact Hel-x Corp., 558 Highland Ave., Upper Montclair, NJ 07043; (201) 744-4962.

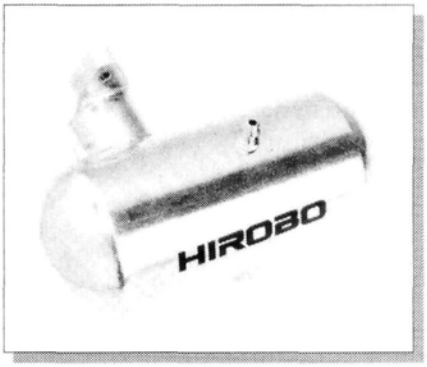
ALTECH MARKETING
SE Muffler

This bigger, quieter muffler improves the power range of engines such as the Enya SS35 heli engine. Exhaust is routed downward, so it won't be blown into your face when your heli is performing a hover with its skids level with your eyes.

Price: $53.25

Part no. 0402-248

For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818; (201) 248-8738.



ROBBE/SCHLUTER
Magic-Profi

Designed for the most demanding and aggressive pattern pilots, the Magic-Profi is fully upgraded and includes a completely ball-raced collective-pitch compensator, blade-holder mixing arms and a tail-rotor lever. Use trapezoid epoxy/glass main-rotor blades and epoxy/glass tail-rotor blades to enhance the Magic's well-known smooth flying.

For more information, contact Robbe Model Sport, 170 Township Line Rd., Belle Mead, NJ 08502; (903) 359-2115.

Helicopter Challenge

Inverted flight: to switch or not to switch?

by CRAIG HATH

BOY, DO I have egg on my face! Two issues back, I promised to wrap up our series on aerobatic/precision flying with some final thoughts on tuning and trimming. Well, here I am with yet another important area that I forgot to cover: inverted flight! Some organized game plan, huh?

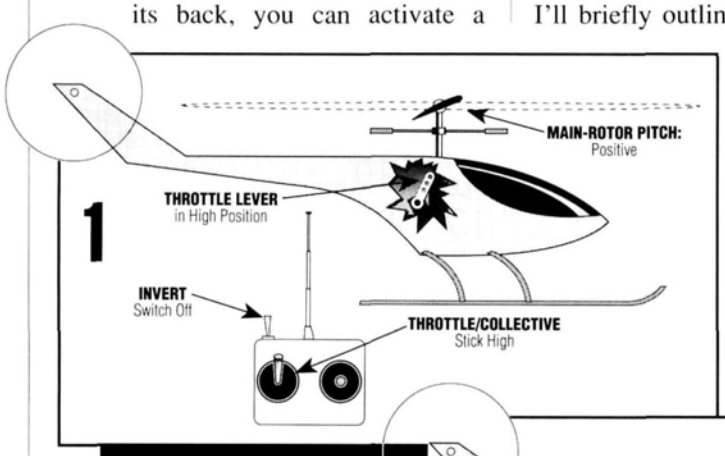
This subject is sure to raise an eyebrow or two among heli pilots. Let's start by saying that there are two schools of thought about setting up for inverted flight. The first says you should set up the machine so that, once it's rolled onto its back, you can activate a switch on the transmitter to reverse collective pitch, fore and aft cyclic and tail-rotor pitch; this allows you to fly the helicopter as if it were upright. With the second method, the collective pitch and throttle are set up so that, as you pull the throttle stick past the center position on the transmitter, the collective pitch will change the rotor blade's pitch to the negative side of the curve, and the throttle will re-open. This allows you to fly the helicopter easily through aerobatics, and it makes entering and exiting inverted flight a little simpler. I'll briefly outline the setup for each method.

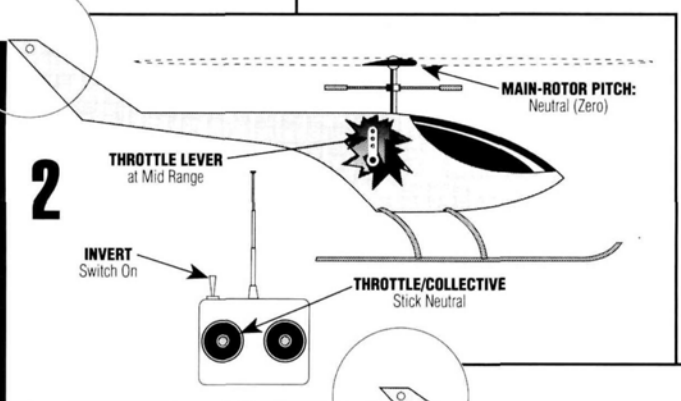
"SWITCHED" INVERTED-FLIGHT SETUP

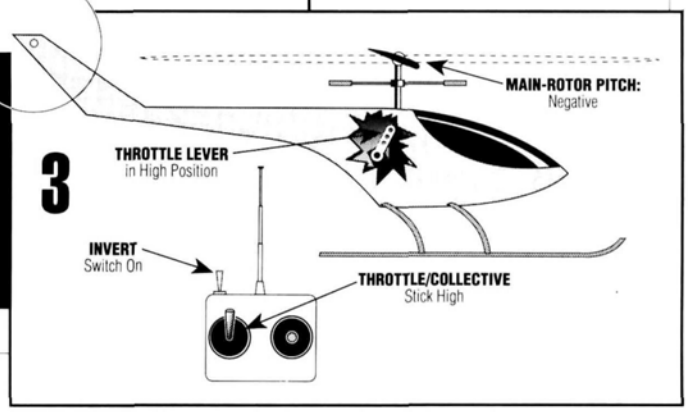
Inverted flight using the invert system built into the transmitter. Most high-end helicopter radio systems offer the invert feature.

This setup requires that the pitch curve be tailored for inverted flight. Be sure that you enable (activate) the invert system on the transmitter. On many radio systems, e.g., the JR Century VII, enabling invert will automatically alter the pitch curve. If this is the case, you'll always have to fly with the invert system enabled (activated, but not switched to inverted), so you'll have to be careful not to hit the switch at the wrong time!

Ideally, you'll be able to set up your machine so that the hover point will be at just about half-throttle, and your upright pitch curve would be pretty much the same as the one you use for normal flight. Flipping the invert switch will reverse the collective pitch, and you want the inverted pitch curve set so that it mirrors your upright curve. This usually doesn't work out exactly, owing to mechanical restrictions, e.g., the presence of differential throw, or mechanical offset in the collective system. If you have to compromise your pitch curve, give up some of the negative pitch. Most helicopters actually require slightly less pitch to maintain inverted flight than they do to maintain upright flight. If you plan to spend a lot of time hovering upside-down, you may find yourself fiddling with the setup in an attempt to match the inverted rotor speed to that of your upright hover. The payoff is worth the extra effort.



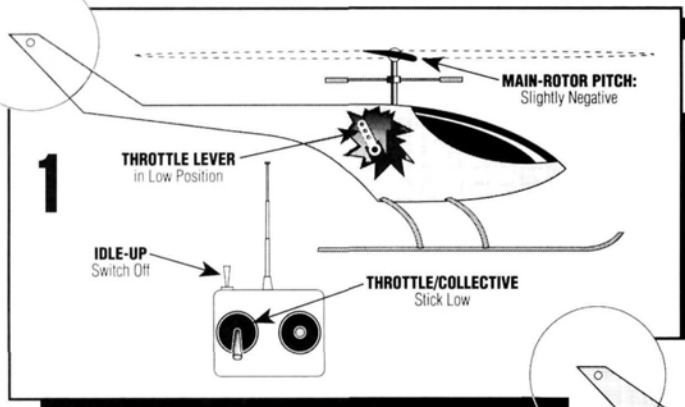


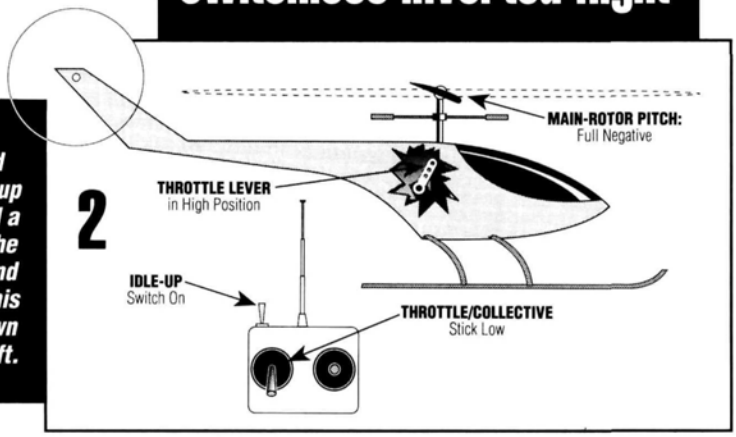


Fundamentals of switched inverted flight

Notice the invert switch, the main-rotor pitch, the throttle lever and the collective/throttle stick positions in figures 1 to 3. As the invert switch is activated (figure 3), the pitch becomes negative, the throttle is opened and the elevator (fore-aft cyclic) and tail-rotor controls are reversed.

Fundamentals of switchless inverted flight





Using the switchless method, when the idle-up or flight-mode switches are turned off, all operation is normal. When the idle-up is activated, the main-rotor pitch will travel a full range from positive to negative and the throttle will open fully at both the high and low collective/throttle stick positions. This will allow the inverted model to be flown much like a fixed-wing aircraft.

FLYING SWITCHED

Be sure to start by checking out the new setup for normal flight. Make a few circuits and trim your machine as well as you can. With the helicopter in forward flight at an altitude that permits you to recover from more than one mistake, roll the helicopter to inverted. As the helicopter rolls, reduce the throttle lever to slightly below the center position and flip on the invert switch. Re-open the throttle and recover into slow forward flight (but now you're inverted). If you reduce the throttle slightly, you may prevent some of the shock of the collective-pitch reversal and soften the collective-pitch change. Continue to fly the helicopter at altitude in forward flight as if it were upright. If you get into trouble, don't panic; simply roll the helicopter to upright and flip the switch into the normal-flight position. (This is why you're flying around at two mistakes high!)

Keep working on inverted forward flight until you feel comfortable, and then try a few climbs and descents. As you get the hang of it, you can bring the machine to a lower altitude and make it hover. If you get into trouble here, just power up and return to forward flight. Once you're used to looking at an upside-down helicopter, you should find inverted flight quite easy. In fact, most accomplished inverted-flight fliers consider the set-up to be the hard part!

"SWITCHLESS" INVERTED-FLIGHT SETUP

Inverted flight using the high-idle, or switchless, method. This requires that your radio system have a high-idle feature and, preferably, an independent, adjustable pitch curve for high-idle. Its set up parameters are similar to those of the switched method's pitch curve except that, as the throttle stick is moved from low to high, the pitch curve will be modified from having extreme negative pitch to having positive pitch, and the throttle will be opened at both the low- and the high-throttle positions.

When you adjust the high idle, set the point adjustment to match the zero-pitch point in the pitch curve. This is the servo travel position at which the high-idle feature begins to function. Normally, as the throttle stick is reduced from high to low, the throttle arm on the carburetor will continue to close. With high idle, the carburetor will only close down to a point that you select with the transmitter, and it will re-open to the setting you've chosen with the high-idle volume selection. Instead of a point or position trimmer, some radios only use a volume setting; don't be confused if your radio employs this type of high idle.

This setup allows upright flight with the throttle/collective control in the upper half of its travel, and inverted flight with the throttle in the lower half of its travel. As you roll or loop the helicopter onto its back, move the throttle stick to the bottom (or low) position to give negative pitch with enough throttle to maintain inverted flight. One major drawback of this setup is that the collective will become very "touchy" and basic hovering will be more difficult than with a standard setup. For this reason, the high-idle independent pitch curve comes in handy. This will allow you to set up a normal pitch curve for hovering, etc., and, once the heli is in forward flight, it will allow you to flip the high-idle switch for aerobatics and inverted flight.

Some new computer radios allow you to set up individual pitch and throttle curves for one or more high-idle settings. In fact, on these radios, it's not called high idle; it can be called "throttle position 1," or "throt./pos. 1," or "flight mode," etc. With this system, you can set up for a constant rotor speed that will have the throttle follow collective pitch. As you pull the throttle stick back, the collective pitch is

HELICOPTER CHALLENGE

decreased and the throttle barrel closes. As you move the throttle stick to around the zero-pitch point, the throttle will be set for an engine speed that gives normal-flight rotor speed. As you pull the throttle stick into negative pitch, the throttle will begin to open again, adding power to maintain the same normal-flight rotor speed until the throttle stick is in the full-low position. Here, full negative pitch is realized, and the throttle is fully opened.

It takes a little tinkering to get this setup to work perfectly, but, when you've finished, the results are outstanding. I normally set up my X-347 or PCM-10 so that switchless inverted is in the flight mode II position. I use a straight line pitch curve that best suits the helicopter; say, minus 7 degrees at the low throttle/collective stick to plus 7 degrees at the high throttle/collective stick position. To get constant rotor speed, I change the throttle curve by adding or subtracting throttle input at the throttle/collective stick positions where there's any sign of rotor under-speeding or overspeeding. You'll find that you can put the helicopter into any attitude and fly right out of it; this will allow you to perform inside and outside maneuvers, etc., easily.

FLYING SWITCHLESS

With the helicopter in semi-fast-forward flight traveling straight and level, roll the helicopter over and, as it comes to inverted, pull the throttle stick back until you're getting lift again. To prevent the nose from coming up, you'll have to pull back on the aft cyclic, instead of pushing on fore cyclic as you would if the helicopter were upright in forward flight. None of your flight controls will be reversed, so you'll be flying the helicopter much as you would an inverted fixed-wing aircraft, i.e., down is up and tail rotor is backwards (roll stays the same). I think this method is easier to get used to, and it gives you much more control when doing aerobatics. On the down side, you might need a lot of practice with this method before you're comfortable enough to attempt an inverted heli hover. Eventually, you'll have a truly omni-directional flying machine without having to flip switches. Anyone for a little inverted nose-on hovering?

For the third time, next month, I'll finish the series on aerobatic/precision flying! After that, I'll step back to the fundamentals of the sport and work with the beginners out there. ■

KYOSHO ADVANCE 6FM-H SERIES 91

A Perfect Choice For Beginner And Intermediate Heli Pilots

by PAUL TRADELIUS

HELICOPTER FLIERS associate Kyosho's name with the Concept 30 series of helicopters, but recently, Kyosho expanded its product line to include three new radios: a 5-channel PCM and 7-channel FM for airplanes and, most important for us, an Advance 6-channel FM helicopter radio. Although I haven't talked with the engineers and marketing people at Kyosho, I believe their intent was very similar to what it was when they introduced the Concept 30 helicopter: to provide a basic product that will work the first time, every time, at a price that almost everyone can afford. This means that the Advance 6FM-H doesn't have all the "bells and whistles" of the more expensive sets, but rather is suited to novice or intermediate fliers who are looking for a complete 1991 radio that will serve their basic flying needs. Let's take a closer look.

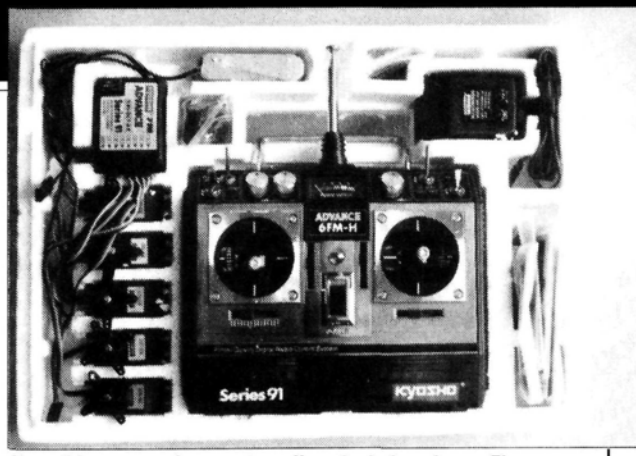
Although the instruction manual isn't very thick, it adequately describes the radio and its features, and it gives a basic explanation of the various functions.

TRANSMITTER

Because of the variety of mixing circuits in the transmitter that accommodate specific helicopter flying needs, the transmitter must be considered the heart of any radio system, and it therefore deserves the most attention.

As I've stated, the Advance 6FM-H is designed as a basic-to-intermediate system; it does away with a lot of the fancier mixing circuits, but it provides the basics needed for all introductory helicopter flying.

ADVANCE 6FM-H



Everything comes in a neat, well-protected package. Five servos and a 1000mAh battery pack are standard.

The transmitter case is made of black plastic that's molded to fit firmly and comfortably in your hands. It's relatively light, so your hands and arms won't be fatigued during those longer flights, and it has a neck-strap attachment point, although a neck strap isn't provided. A carrying handle on the back of the transmitter also acts as a stand to keep the back of the transmitter off the ground.

The top left of the transmitter has an idle-up switch, a gyro-sensitivity switch and revolution mixing control knobs.

The top right of the transmitter has the pitch-trim knob, the aileron and elevator dual-rate switch and the throttle-hold switch.

One of the first things you'll notice about the transmitter is that the top front panel is tilted forward about 45 degrees to provide easier access to the switches and knobs. Also, its bottom face has a plastic cover that tilts forward to allow access to the adjustment potentiometers for the many helicopter functions.

FEATURES

- **Revolution mixing:** both up and down mixing are provided to adjust the tail-rotor compensation for climbing and descending.
- **Idle-up:** enables the throttle to maintain a preset minimum speed regardless of low collective pitch/throttle stick position for descents and aerobatic flights.
- **Throttle hold:** used to keep the throttle at a preset position—usually at or near idle—to practice autorotation landings.
- **Aileron/elevator dual rate:** allows two sensitivity positions to customize the helicopter's "feel" during various phases of flight. A low setting may be used to improve hover performance, and the high setting can be used for aerobatics, where more aggressive servo movement is needed.
- **Pitch trim:** used to make minor adjustments to the collective pitch, usually around the hover position. The disadvantage, however, is that any change made to the collective pitch during hover will affect the high and low collective-pitch settings.
- **Gyro sensitivity:** a two-position switch enables you to switch gyro-sensitivity positions during flight. The high sensitivity can be used for hovering, while a lower sensitivity would be more beneficial for forward and aerobatic flight. This will only work if you have a gyro with a dual-sensitivity feature.
- **Pitch curve:** a high and low pitch-curve adjustment allows the high and low collective-pitch settings to be easily set and changed according to your helicopter's performance.
- **Servo-reversing:** although now almost standard in modern equipment, this feature lets you mount your servos and pushrods in the most straightforward way, and then reverse the movement of the servo, rather than of the linkages, if needed.
- **Throttle end-point adjustment:** allows the engine carburetor to be easily set to match the collective pitch, and gets just the right idle and full throttle without the need for mechanical adjustments. This feature doesn't sound like much, but if you've ever had to adjust a throttle linkage by the old bending method, you'll know that this is worth its weight in gold.

RECEIVER

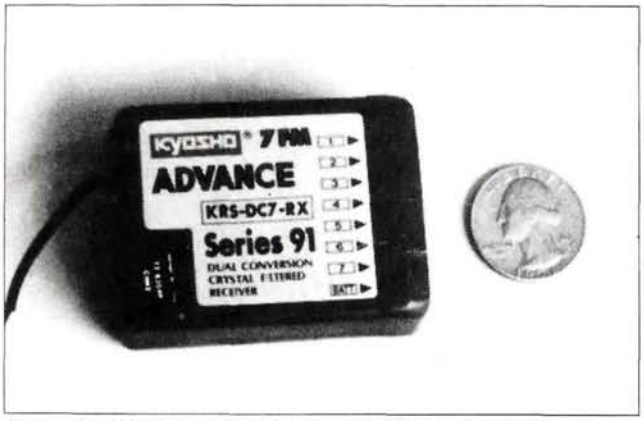
Here's everything you need to know

All the adjustment potentiometers and the servo-reversing switches are under the transmitter's lower front cover. The switches are well-marked and user-friendly.

about the receiver: it's small, light, of 1991 narrow-band design, and it works all the time. The transmitter and the receiver have removable crystals, so I assume that you can buy additional crystals to change frequencies at the field.

Not only did Kyosho provide all the basic functions needed for helicopters, but they also listened to us heli fliers when we told them which accessories we'd like to see with a heli radio. By this, I mean that they included a 1000mAh battery as standard equipment, although, unfortunately, the battery charger is only rated at 55mAh (a 100mAh charger would have been better). But at least we don't have to buy an additional battery to power all those servos and a gyro, and still provide an adequate safety margin.

Five servos are also standard, although, from the information provided, they appear to be for sport-type flying. Their torque is relatively low—advertised at almost 38 ounces per inch—and no ball bearings are used on the output shaft. Additional servos aren't listed in the information sheet, but I hope that, in the future, Kyosho will provide a servo of a higher quality for our more demanding helicopters. I do, however, have to admit that these servos worked well from the very first flight—and continue to do so—with no sign of wear or lack of power.



The small, light Series 91 receiver does it all. It has a removable crystal, so you can change radio frequencies.

SUMMARY

The Kyosho Advance 6FM-H appears to be an excellent entry-level and intermediate radio; it provides all the basic functions needed for helicopters at a very competitive price. Its overall appearance, quality of materials, and well-thought-out switch positioning make this radio a pleasure to use.

** Here's the address of the company featured in this article:*
***Kyosho/Great Planes Model Distributors**, P.O. Box 4021, Champaign, IL 61824.* ■

P-51D

(Continued from page 90)

I recommend the Great Planes P-51D kit to anyone who wants what I consider to be the best-looking, best-flying sport-scale P-51 on the .40 market. The plane's overall looks and the possible wing modifications give it contest-winning potential in a stand off-scale or fun-scale contest. With the best-loved WW II fighter, you'll get "oohs" and "aahs" from your flying buddies, even if you're sport-flying. Of course, it helps if you're in love with the P-51—as I am.

** Here are the addresses of the companies mentioned in this article:*

Great Planes Model Manufacturing, *P.O. Box 788, Urbana, IL 61801.*

Zap-a-Dap-a-Goo; *distributed by Frank Tiano Enterprises, 15300 Estancia La., W. Palm Beach, FL 33414.*

Pactra Inc., *620 Buckbee St., Rockford, IL 61104.*

Robart Mfg, *310 N. 5th St., St. Charles, IL 60174.*

B&D Enterprises, *Rte. 81, Box 7, Ballard, WV 24918.*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

E-Z; *distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728.*

Slimline Mfg., *P.O. Box 3295, Scottsdale, AZ 85257.* ■

SPORTY SCALE

(Continued from page 83)

find it because it's out of print or your dealer just doesn't carry the publication, try giving Bob or Judy a call. Like me, you might get a real surprise! Yes, they offer catalogues of all sorts of military stuff, not just airplanes.

TOP GUN TIPS

Well, that should keep you happy for a few weeks. Before closing, I'd like to

(Continued on page 106)

SPORTY SCALE

(Continued from page 102)

take the time to explain how you can be instrumental in getting someone an invitation to Top Gun '92 in West Palm Beach, FL. For an Expert-Class invitation, we need to know the name of the pilot, a detailed history of the planes he or she has flown in competition, and where the candidate has competed over the last few years. A list of any accomplishments would really be nice and most welcome. The Top Gun board looks for scale modelers with some contest experience. They need not be national champions, but must be above-average builders and pilots. For Team Scale, it's a little easier. Once again, we look for contest experience, but only from the pilot. So, if you know of a good model builder, or are one yourself, just team up with a knowledgeable pilot and send in your team résumé.

Last but not least, to compete in the Manufacturers Unlimited class, just find a sponsor, get yourself three or four team members, complete with shirts and hats, and grab a good pilot. You can buy the airplane! Six entries are allowed, and they'll compete against one another.

Once again, Top Gun will be co-sponsored by *Model Airplane News* and Pacer Technology, with a lot of industry support. Once again, it will be held in Florida at the West Palm Beach Polo and Country Club and, once again, it promises to be the world's premier scale event. The dates are Thursday, May 8 through Sunday, May 11, and practice starts on Wednesday, May 7. In the very near future (maybe the next issue), we'll give you a toll-free number to reserve rooms and airline tickets. American Airlines has offered their help again for 1992. *(Continued on page 108)*

SPORTY SCALE

(Continued from page 106)

By the way, for those who have written and asked for Top Gun '91 T-shirts, they're available directly from the Polo Club at the address at the end of the column. The price has been reduced to $12 (which includes first-class postage). They're high-quality, multi-colored shirts, and they're offered in all sizes, but you might want to indicate an alternate size or instructions to return your money if they are out of your size by the time you order. Yes, they do have a toll-free number for all but Florida residents; and yes, they do accept all major credit cards!

So long for another month. Keep those cards and letters coming. Until next time, remember that pusher props will *not* stay on all by themselves, Tom Atwood did *not* design the original .049 engine, and it's most important to keep checking that six.

**Here are the addresses of the companies mentioned in this article:*
Aerrow Inc., *P.O. Box 183, Perth, Ontario, Canada K7H 3E3.*
US Quadra, *1032 E. Manitowoc, Oak Creek, WI 53154; (414) 762-7155.*

(Continued on page 109)

SPORTY SCALE

Don Smith Plans, *2260 N. Dixie Hwy., Boca Raton, FL 33431; (407) 395-9523.*
The Aeroplane Works, *2134 Gilbride Rd., Martinsville, NJ 08836; (908) 356-8557.*
Silent Spark; *distributed by Tran-Sil, 200 S. Orchard Dr., N. Salt Lake, UT 84054; (801) 298-7254.*
Wings and Things of Time, *1858 Waterbury Rd., Cheshire, CT 06410; (203) 272-1186.*
Articles of War Ltd., *8806 Bronx Ave., Skokie, IL 60077; (708) 674-7445.*
Palm Beach Polo Gift Shop, *13420 S. Shore Blvd., W. Palm Beach, FL 33414; (800) 327-4204.* ■

AIRWAVES

(Continued from page 10)

somewhat to the left. On a crankshaft cut for clockwise rotation, the port will be to the right. Many 1/2A engines don't use front induction; the gases are inducted from the rear by means of a flexible reed that responds (by flexing inward and letting in gases) to negative crankcase pressures. Called "reed-valve induction" engines, they'll in fact run in either direction without any modifications. CC

KAWASAKI CORRECTION

In your otherwise fine coverage of the Top Gun event (September '91 issue), I find one glaring error on page 44. Wayne Siewert's Ki-84 Nakajima "Frank" is NOT a radial-engine "Tony"! There *was* a radial version of the Tony—designated the "Ki-100"—and it was created by "marrying" a Kawasaki Ki-61 Tony to a Mitsubishi Ha 112-II radial engine.

Your identification error had plenty of company during WW II when the Kawasaki Ki-100 suffered the indignity of not being recognized as a distinct fighter type and was often reported to be a Nakajima "Frank."

KENT WERNER
Murphysboro, IL

Kent, I wish I could say our mistake was made from the cockpit of a fighter, in the heat of combat, when unfamiliar enemy fighters were coming at us, but nothing that dramatic caused the error. Often, a photo caption will be too long to fit the space it's assigned to, and we then shorten it. It's obvious that, having been

(Continued on page 127)

ABOUT THOSE ENGINES

by JOE WAGNER

Teflon treatment for 2-strokes

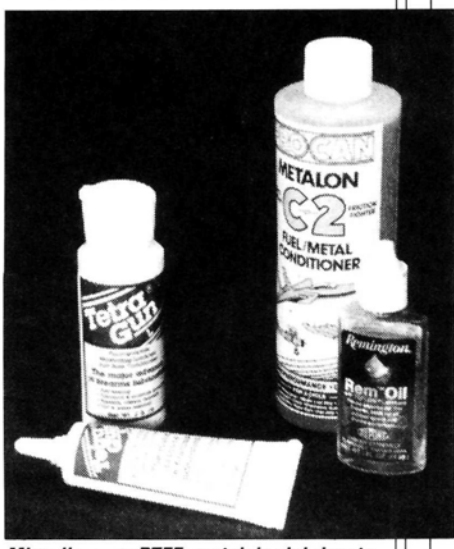
A YEAR AGO in this column, I discussed the lubrication of 2-stroke engines. Since then, I've received many queries and comments on that subject, plus samples of some new lubricating products to test. It looks as if now is a good time to return to this topic for further scrutiny.

Oil in 2-stroke fuel has *four* jobs to accomplish, not two as I said earlier. Oil lubricates, cools and prevents corrosion; it also serves the same purpose as water-injection does in full-scale engines, i.e., oil in 2-stroke fuel inhibits detonation.

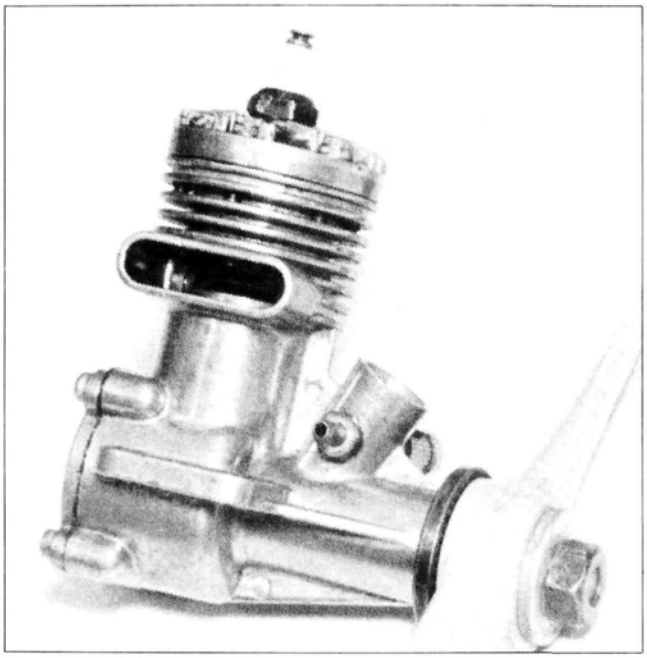
It's good to remember the last property on a hot day when your high-compression engine performs poorly owing to premature firing of the fuel-air mixture in the combustion chamber. The usual "fix" for this is to change to a "cooler" glow plug, but adding castor oil to your fuel will accomplish the same thing. (Try 3 ounces of castor oil for each quart of fuel.)

Lately, there's been a lot of advertising hoopla about new lubricants that contain micron-size Teflon (polytetra-fluorethylene, or PTFE) powder. The theory is that the tiny PTFE particles will impregnate the "pores" of metal parts, and provide a microscopically thin, yet durable, slippery layer between rubbing surfaces.

Many of these PTFE lubricants are intended for use in firearms, and there, they do an excellent job. Model engines work under totally different conditions, though. Few guns are fired more than 100 times a year; but while running, a miniature 2-stroke engine fires twice as often each second! Can PTFE improve the performance of a model engine? I decided to find out, using Tetra Lube* samples.



Miscellaneous PTFE-containing lubricants. The Tetra Gun gave a 600rpm gain in a typical lapped-piston motor.



The spark-spitting Veco .19. A new aluminum head gasket cured a most mysterious malady!

TETRA LUBE TEST

Since Tetra Lube products are called "surface conditioners" by their maker, and because PTFE decomposes above 700 degrees Fahrenheit and releases highly corrosive fluorine gas, I didn't add Tetra Gun to glow fuel. Instead, I chose one of my well-run-in, lapped-piston, plain bearing, sport-type U-control engines. I put it on the test stand and ran it (as if it were in a model) on 10-percent-nitro fuel with 28-percent-castor-oil lubricant. I used a "bigger-than-usual" prop such as I always fly with, and the engine turned 9,800rpm.

Immediately afterward, I removed the engine from the stand, completely disassembled it, then rubbed every part surgically clean with dope thinner and paper towels. After that, I rubbed Tetra Gun oil thoroughly into the mating surfaces of every moving part except the piston and the cylinder. I wiped off the residue, re-assembled the engine and put it back on the test stand. This time, it turned 10,400rpm!

Apparently, PTFE does help model motor performance. Of course, a single test doesn't prove a lot. It does, however, show definite promise; enough to justify a much more thorough test program later, with several other engines. The engine I chose for this experiment seemed made for this test; I'd expect less benefit from PTFE in a smaller, faster-running engine, but I could be wrong! Keep watching this column for developments!

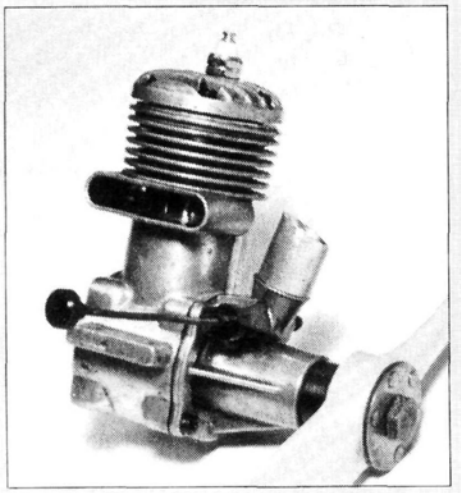
Q&A SECTION

I always appreciate readers' input, and I respond to every letter I receive (please include a SASE, though). I do my very best to answer all the questions thoroughly and accurately—even if it takes several pages. Sometimes, the questions are of general interest and can be answered briefly; I'll respond to such queries in this "Question and Answer" (Q&A) section. Please send your model-engine queries to me at 251 Danbury Rd., Wilton, CT 06897, not to the Mount Morris, IL, subscription office!

MICRO MODEL WASP TWIN

Don Briggs, of Curtis, NE, sent photos of a twin-cylinder engine he has had for 36 years. Don writes, "On the test stand, I started one cylinder, then transferred the glow-plug leads to the other, and it ran beautifully, even though rpm is about half that of a single-cylinder engine." Don's letter asked several questions about his engine: when, where, and by whom it was made, its exact displacement and how rare it is.

My reply to Don filled two single-spaced pages, answering all the questions he had asked. To summarize: Don's engine is a Wasp twin: .604 displacement; made in 1946 by the Micro-Model Co. in Los Angeles, CA. It was built and sold as a spark-ignition type complete with a twin-terminal coil.



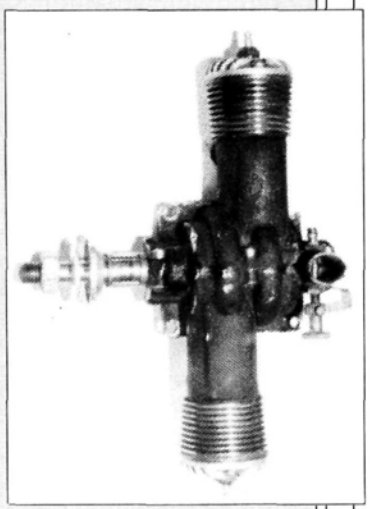
This 1954 McCoy Super Stunt .29 (with a home-made intake extension) served as a test specimen for PTFE lubricants. Its speed increased by almost 7 percent.

Parts for at least 3,000 of these engines were manufactured, but nowhere nearly as many were ever assembled. The engine didn't sell well for two reasons: there was a lot of competition in the model engine business in 1946, and three similar twins were on the market at the same time: the Vivell, the Viking and the Ace. Manufactured in or near Los Angeles, the Vivell wasn't bad, the Viking (in my opinion) was junk (I never saw one run on more than one cylinder), and the Ace performed very well indeed (it was by far the best-built of the .60-size opposed twins). The Wasps functioned all right, but didn't develop much power. My guess is that fewer than 1,000 Wasp twins were sold. (I owned two of 'em myself.)

One big problem with opposed-cylinder 2-stroke twins is getting the same mixture to both cylinders. The Viking was especially bad at this. It seemed impossible to set its needle so that both cylinders fired together. The Ace design was ingeniously arranged to distribute its crankcase mixture equally to both cylinders, but it was expensive to manufacture and only a few hundred were sold.

UNEXPECTED ENGINE EXTRAS

Jerry Price, of Royal Oak, MI, wrote, "I've found metal chips and debris in two brand-new engines of a highly regarded make. One engine I bought mail-order some time ago; the other from a local hobby shop last month. In the past several years, most new engines I've purchased have needed some cleaning up and de-burring before I felt they were ready to run. What are we coming to, anyway?"



This 1946 Micro Model Wasp twin was sold originally as a spark-ignition engine; Don Briggs of Curtis, NE, runs it on glow.

I've seen new engines with flaws like those Jerry mentions. One possible cause is lack of care by the people who assemble the engines. Most of them aren't modelers themselves, and they aren't as meticulous in their work as you or I would be. The parts of the engines they put together are delivered to them in bins and buckets. Metal chips and dirt inevitably fall into these during handling, and some lodge inside the parts.

A practical joke turned a dozen Fox .35s like this one into major disappointments for their buyers. No one was hurt, but the Fox reputation suffered!

The other possible cause is deliberate sabotage. Model engine makers have the same personnel problems as all manufacturers do: there's always at least one prankster or sorehead among their workers. Here's an example: in the '50s, one of Duke Fox's people secretly made a batch of cylinder heads out of Cerrobend, which is an alloy that looks just like aluminum, but melts at about 190 degrees Fahrenheit. He assembled a dozen or so Fox .35s with these counterfeit heads. You can imagine what

(Continued on page 136)

AIRWAVES

(Continued from page 109)

made by different manufacturers, the two types—the Frank and the Tony—were totally different planes. Before the caption was shortened, the writer did point out what the two types did, however, have in common. They were two Japanese fighters—both with a performance that surpassed the famous Zero's—that had their promising potential thwarted by the same things: severe problems with engine servicing and production delivery. When we shortened the caption, this similarity was misinterpreted to imply some sort of shared lineage. It's interesting to note that, had the Japanese been able to produce the Kawasaki Frank and/or the Nagkajima Tony (especially the Ki-100 radial version) in large numbers earlier in the war, American fighter groups would have had a much tougher time dealing with things. Thanks for bringing this to our attention, Kent, so that we could get it ironed out; we apologize for the confusion. CC

SMOKE OF A DIFFERENT COLOR

In June '91, "Airwaves," there was a letter about colored chemical smoke and the difficulty of making it. Here in the Los Angeles area, there are many suppliers of the colored chemical smoke used in the movie industry; one such is Tri-Ess Sciences, 1020 W.Chestnut, Burbank, CA, 91506.

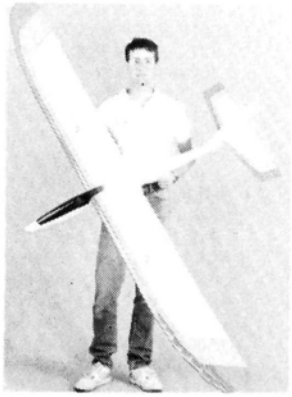
The smoke-producing chemicals come in a variety of forms for different effects and a large range of vivid colors. They all burn at a low temperature that won't char paper, and they're fairly safe to use.

BILL YOUNG
N. Hollywood, CA 91605

(Continued on page 135)

PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Model Airplane News, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Model Airplane News.



GREAT PLANES MODEL MFG. Spirit 100

Great Planes' Spirit 100 is a standard-class sailplane for beginners and experts. The advanced version combines state-of-the-art aerodynamics with the ability to use computer radios. Specifications: wingspan—99 1/2 inches; wing area—946 square inches; weight—50 to 65 ounces; airfoil—Selig's 3010 or 7037 (both included).

For more information, contact Great Planes Model Mfg., P.O. Box 788, Urbana, IL 61801; (217) 398-3630.

BRIDI AIRCRAFT DESIGNS Bizzee Bee

Bridi's new 1/4-scale Bizzee Bee is a highly aerobatic, low-wing sport flier with a tapered, symmetrical airfoil. The kit includes wheel pants, a windshield, a cowl and limited hardware. Specifications: wingspan—96 inches; wing area—1,630 square inches; weight—13 pounds (without engine); engine—.90 (or larger) 2-stroke.

Price: $319.95

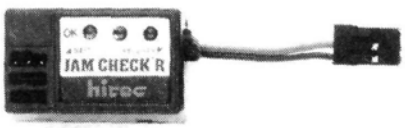
For more information, contact Bridi Aircraft Designs Inc., 23625 Pineforest Ln., Harbor City, CA 90710; (213) 326-5013.

VAILLY AVIATION Giant-Scale Aerobatic Sport Models

The Vailly Sport is designed to use economical engines. The all-wood, built-up structure uses conventional materials and assembly techniques, and requires a 4- or 5-channel radio. Specifications: wingspan—88 inches; wing area—1,306 square inches; weight—15 to 20 pounds; engines—Quadra Q-35 or Q-42; Zenoah G-38; Super Tigre 2500/3000.

Price: plans package (plans, cowl, landing gear, wheel pants)—$100; plans package and cut wooden parts—$185.

For more information, contact Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738; (516) 732-4715.



HITEC R/C USA Jam Check'r

The Hitec Jam Check'r offers the simplest, most effective way to check for and help to eliminate the excessive current drain that's caused by servo and linkage jams. The very small Jam Check'r is plugged in between the battery and the receiver. When a servo is moved to its max throws with linkages connected, the Jam Check'r detects and alerts you to jams with three LEDs.

Price: $14.95

For more information, contact Hitec R/C USA, 9419 Abraham Way, Santee, CA 92071; (619) 449-1112.

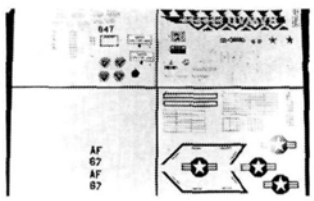
ASTROFLIGHT Astro Cobalt 15 FAI Racing Motor

The Astro Cobalt 15 FAI racing motor is designed to win FAI 10-cell F3E sailplane competitions. Its features include a special heavy-steel field ring for maximum magnetic flux; Astro's new, slotted, silver racing brush; and a seven-slot armature wound with seven turns of 19-gauge wire. For direct drive, use Astro's 8x4.5 folding prop; for gear drive, use its 4033 gearbox and 12x9 folding prop.

Price: $129.95

Part no. 6610

For more information, contact AstroFlight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (213) 821-6242.

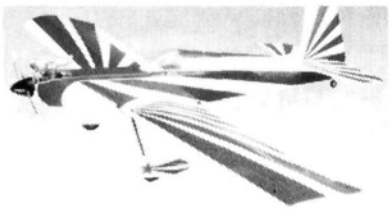


JET HANGAR HOBBIES F-4 Phantom II Decals

Decals are now available for Jet Hangar Hobbies' F-4 Phantom II in sets of four 9x12-inch sheets. Included are all markings for the Hawaiian ANG F-4C (also appropriate for the F-4D, which was flown in Vietnam in 1972 and for the F-4D from the 18th Tactical Fighter Wing of the 44th TFS.

Price: $40

For more information, contact Jet Hangar Hobbies, 12130G Carson St., Hawaiian Gardens, CA 90716; (213) 429-1244.



U.S. AIRCORE
Colt 40™ SLT

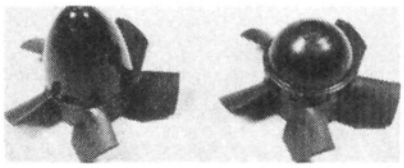
The rugged Colt 40™ is a great way to learn low-wing basics, and it can be built in a few evenings! If you're beyond the learning stage, select the turbo option; it gives the Colt a 58-inch wingspan and a slightly smaller tail. Specifications: weight—5.75 pounds; wingspan—64 inches (Turbo version—58 inches); fuselage length—41 inches; engine—.40 to .45 2-stroke, .50 4-stroke; number of channels required—4.

For more information, contact U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248; (214) 250-1914.

UNIVAL CORP.
Refillable Butane Pencil Torch

Unival's new, butane pencil torch can be refilled by using a standard butane fuel canister. It burns for approximately 45 minutes on one charge and reaches a high temperature of 2,450 degrees Farenheit. The torch can be used for a variety of modeling applications, e.g., bending glass, plastic, or metal tubing, and for soldering.

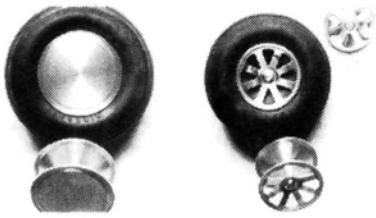
For more information, contact, Unival Corp., 498 Nepperhan Ave., Yonkers, NY 10701; (914) 969-6922.



KRESS JETS
English Micro-Mold Rotor

The English Micro-Mold rotor for .20- to .45-class ducted-fan engines is now available from Kress Jets. (When used with .45 engines, the rotor's maximum tip diameter is 5 inches.) The glass-filled, segmented, nylon rotor comes assembled and fitted with a streamlined CB spinner or the Micro-Mold belt-start spinner. Replacement blades are inexpensive and easy to install.

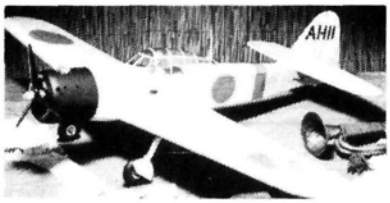
For more information, contact Kress Jets Inc., 4308 Ulster Landing Rd., Saugerties, NY 12477; (914) 336-8149.



E. BARTON MACHINE
Custom-Made Retract Accessories

Master builder Gene Barton, who flies the famous Skyraider, now manufactures a full line of solid and spoked rims, struts (with or without scissors), and straight and rotating retract mechanisms for scale enthusiasts. Since the size required depends on your aircraft's scale, call for prices.

For more information, contact Gene Barton, E. Barton Machine, 11640 Salinaz, Garden Grove, CA 92643; (714) 539-9142.



MIDWEST PRODUCTS
Midwest Zero

Learn to fly a tail-dragger with the Midwest Zero. Midwest's Micro-Cut® quality wooden parts, combined with a jig-lock fuselage, D-tube wing construction and all-sheet tail surfaces, speed up construction. Specifications: wingspan—60 inches; wing area—552 square inches; flying weight—5 to 5 1/2 pounds; radio—4-channel; engine—.35 to .45 2-stroke or .40 to .50 4-stroke.

Part no. 172

Price: $119.95

For more information, contact Midwest Products Co. Inc., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342; (219) 942-1134.

COX HOBBIES
Cox Failsafe Single-Channel R/C System

Cox Hobbies' Failsafe single-channel R/C system that was factory-installed in the successful Electric Flyboy and the .020-powered Turbo Centurion is now available separately. This system is suitable for all types of simple R/C aircraft, from electric-powered indoor R/C (BEC version available) to many old-time single-channel favorites! The transmitter is available in 27MHz and has a "Silver" sticker rating.

Price: $59.95

For more information, contact Cox Hobbies Inc., 350 W. Rincon St., Corona, CA 91720; (714) 278-1282.

CLUB OF THE MONTH

Anoka County Radio Control Club
278 120th Ln. NW, Coon Rapids, MN 55433

If three words could sum up the contents of the June issue of "Servo Chatter" (the newsletter from the Anoka County Radio Control Club, of Anoka County, MN), they'd be *"people"* and *"flying site."*

On the subject of their flying site, the newsletter thanks the members involved with the production of the club's new control board. Judging from the photos, the board was a labor of love and has been updated to include odd frequency channels. The self-contained board has a roof for protection against the elements, a large, easy-to-see face and storage shelves in the lower half (radio impound?). It's great to see a professional approach to frequency management at flying fields.

It's people, however, who dominate the newsletter. President Dan O'Link gives special thanks to member Mike Peach for his excellent first-aid presentation at the field. Unfortunately, this topic is often overlooked by clubs—and this can lead to dire consequences. Mike also supplied the club with a well-stocked first-aid kit. The message? Prevention is the best medicine! Jeff Slater, the club's field and safety officer, contributes his thoughts in a condensed product review of the Roun' Tuit. Photos of other members and their models are found throughout the newsletter.

It's obvious from their newsletter that this club values its members' opinions, involvement and safety. It's also clear that the members actively support their club and the club's officers. For their high level of involvement and teamwork, we award two *Model Airplane News* subscriptions to our newest "Club of the Month." ■

CLASSIFIED

Non-commercial Rate: 15 words or less, $4.50; additional words, 25¢ each. No charge for name and address. (No commercial ads of any kind accepted at this rate) *Commercial Rate:* 50¢ per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. *All ads must be paid for in advance.* To run your ad for more than one month, multiply your payment by the number of months it is to run. *Deadline:* the 10th of the third preceding month (e.g., January 10 for the April issue). We don't furnish box numbers, and it isn't our policy to send tear sheets.

SEND AD AND PAYMENT TO: CLASSIFIED ADS, MAN, 251 Danbury Rd., Wilton, CT 06897 ATTN: Laura Kidder

BERKELEY, CLEVELAND, ETC., replica kits, duration rockets for jet models. Send three stamps to: WILLAIRCO, 2711 Piedmont Rd. NE, Atlanta, GA 30305.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

1930s to 1950s MODEL AIRPLANE MAGAZINES; 1930s aviation pulps, complete and good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

START YOUR OWN HOBBY SHOP or buy for friends or group; 30 to 60 percent off. For information, send $1 and no. 10 SASE: R&L HOBBIES, 10334 Portage Rd., Portage, MI 49002.

WANTED: kits from 1950s and '60s, especially: Monogram, Berkeley, Speedee-Bilt, Babcock, Veco, Scientific U/C, deBolt, Top Flite, Taurus and Tauri. Dr. Frank Iacobellis, 15 Highland Park Pl., Rye, NY 10580; (914) 967-5550.

FOR SALE—GMP Rebel helicopter kit; new; latest production run: $180. Legend Elite kit; full ball bearings; unopened: $525. H. Keith, 2287 Country Rd. 314, Ignacio, CO 81137; tel.: (303) 563-4311.

FUJI-MAX USA is again supplying CDI ignitions kits and supplies (See Sept. '88 *RCM*). Kit price: $34.95 postpaid. Send SASE for info to: FUJI-MAX USA, 3 Larkspur Way, Gaithersburg, MD 20877.

VACUUM FORMING—Do it yourself! New 128-page illustrated book shows you how. Make car bodies, helicopter canopies, airplane parts and boat hulls. Start with ultra-low-cost basic setup, or form up to 1/8-inch-thick plastics with innovated, two-stage vacuum system. Make a high-vaccum source for less than $6. Eight chapters include Plastics, Molds, Heat & Vacuum Sources, tips and examples. It's easy! Try it! $9.95. Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360.

HELICOPTER SCHOOL—5 days of hands-on instruction with X-Cell helicopters and Futaba computer radios. Small classes tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 125 satisfied students and 4,400 flights logged in our first 14 months of classes. Located on 67-acre airport used exclusively for R/C training; owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Send for *free* information and class schedule *now!* R/C FLIGHT TRAINING CENTER, P.O. Box 727, Crescent City, FL 32112, or call (904) 698-4275 or Fax (904) 698-4724.

GIANT SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call Michelle, (800) 243-6685, or write to Air Age, Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 3,000 different Foto-Paaks and 10,000+ drawings. Catalogue $4. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

INTERNATIONAL AIRCRAFT RESEARCH—Need documentation? Include name of aircraft for availability of documentation with $3 for 3-view and photo catalogue. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $2.95 S&H for first item; $1 for each additional item. *Foreign:* (including Canada and Mexico)—*surface mail*, add $4 for first item, $2 for each additional item; *airmail*, add $7 for first item, $2.50 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. Connecticut residents add 8% tax. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

MINIATURE AIRCRAFT CORP. model kits wanted. Alan Mironer, 269 Concord Rd., Bedford, MA 01730; (617) 275-0962.

FOR SALE—Florida HOBBY SHOP specializing in R/C; seen a profit for 8 consecutive months. For info, write to 1808 Catawba St., Columbia, SC 29205.

BUILD THE WRIGHT J-5 Whirlwind 1/4-scale model engine; nine cylinders, 124cc (7.6ci); 40 drawings, 300x210mm (11.8x8 1/4 inches), and 34 pages of instructions: $38 (includes postage—international money order or cash acceptable). For anyone interested in building this engine there are now high-quality die-cast heads that are designed for use in both in-line engines and radial engines from one to 18 cylinders. J-5 die-cast heads with two rocker boxes $25/set (includes postage). For more info, send $3 for catalogue. Carl E. Carlsson, Box 34, S-831 21, Östersund, Sweden.

R/C HELICOPTER TRADER. Published every other week. Helicopters, parts and accessories. For free copy, send SASE to P.O. Box 702, Arlington, TX 76004.

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $2 for large list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555. (619) 375-5537.

NEW: SOCKET-HEAD SHEET-METAL SCREWS—no. 4x1/2@ $5.45/100. Metric M3.5x15mm socket cap screws for Super Tigre @ $4.40/20 (all orders add $3.50 S&H). For *free* catalogue, contact: Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (908) 806-4050.

7-FOOT & 11-FOOT WINGSPAN—BV138 German, three-engine flying-boat, precision-scale plans. Five sheets (7 1/2x3 feet). Also, Albatross W-4 floatplane with 93-inch span. Details and photo for two stamps. Gene Falada, 22W070 Byron Ave., Addison, IL 60101.

PLANS ENLARGED—Aviation art, plotting service, model software. Free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

BALL BEARINGS—chrome steel; in stock to fit most model engines; metric or standard; Fox, K&B, O.S., OPS, Webra, YS. SASE: REVMOR, P.O. Box 548, Palm City, FL 33490; (407) 283-6831, after 5 p.m.

FIFTY TO 100 PERCENT OFF the price of a new engine for your old ignition engine and parts! Quick cash for your ignition engines, parts and collections. Send by UPS, and you can expect a check from us. Also, 1/4-scale Piper Tri-Pacer plans, 88 1/2-inch span, $29.95. HDFG cowl, $40. Partial kit, $149.95. Send large, stamped SAE for giant bulletin of scale plans, built-up R/C planes, engines and radios. Carl Miller, 130 Yucca Dr., Sedona, AZ 86336.

AIRCRAFT COLLECTOR CARDS. Full-color, "baseball-card-size" from original paintings. Two beautiful sets available. No. 1—Warbirds; no. 2—Jets, $7 per set plus, $2.50 P&H. Universe Games, 702 1/2 W. Fremont, Selah, WA 98942.

DESERT STORM TECHNOLOGY COMES HOME!! Shoot stunning *live-action video* from your plane, heli, sub, etc. Supercircuits, 2.2-ounce microvideo camera makes it possible. Under $200! Transmitters, How-To Videotapes and more! Send $2 for catalogue to: SUPERCIRCUITS, 1403-B Bayview, Hermosa Beach, CA 90254; (213) 372-9166.

P-38! COLUMBIA MODEL WORKS is now offering a full kit for its giant-scale P-38. Scale and sport-scale versions are available with 95-inch and 105-inch spans, respectively. This balsa-and-ply kit builds into a spectacularly flying fully aerobatic model. Demonstration flights available for those traveling through our area. Kit price: $495, includes shipping. For info pack, send $1 to: Columbia Model Works, 3411 Sherwood Dr., Columbia, MO 65202, or call (314) 474-3285.

NEW, NEVER-USED programmable Futaba 8JN, 72MHz radio. (Must sell owing to frequency difference in Europe.) Features four servos; charger; transmitter; off-check, roll, snap-roll buttons; upright-inverted trims; 4-channel mixing; dual-rate; Program sheets new in box. Cost more than $600, will sell for half! Bob Cline, Otto Hahn Str. 16, 2903 Bad Zwischenahn, W. Germany.

SCALE DOCUMENTATION, PLAN ENLARGING. 88 super-scale, giant, sport R/C construction plans; three-views; cutaway drawings; 85,000 documentation photos in stock; 125-page catalogue, $5 ($9 overseas). Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403. Tel.: (919) 292-5239. Visa, Mastercard.

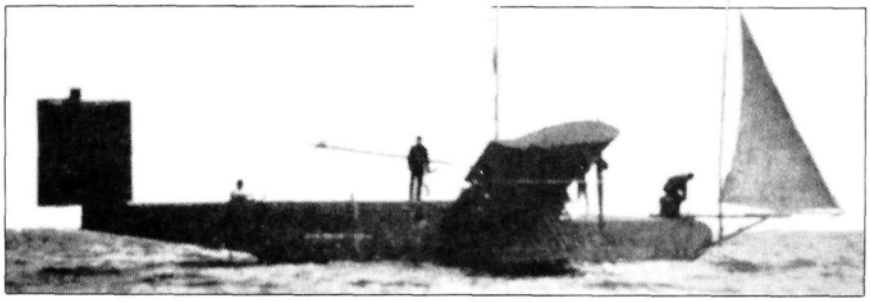
COMPUTERIZED AIRCRAFT PLOTS: Technical illustrations suitable for framing. Three-views. Computer scale drafting and scanning services. Turn old prints into masterpieces! Catalogue, $1. D-TECH SYSTEMS, Rte. 2, Box 191-14, Carterville, IL 62918.

FLY THE "REVOLT"! 33-inch wingspan, Golden Age, low-wing, free-flight. Field-convertible from rubber power to IMP-30 electric (and back) in 5 minutes. Full-size plans, instructions and photos. $9.95 postpaid. ScienText, 48 Whitney St., Westport, CT 06880; (203) 221-1326.

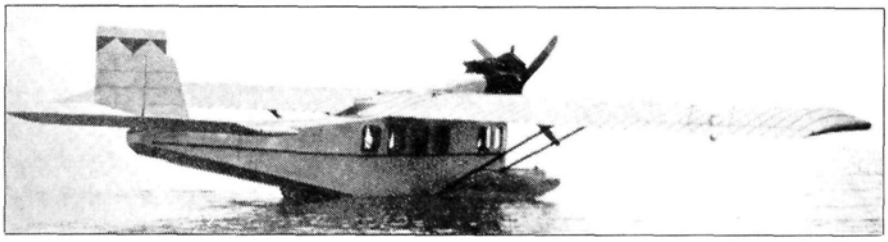
NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name that Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Jerry Greaves of Newtown, CT, for correctly identifying the August issue's mystery plane. The Dornier Delphin III is a modified version of the slightly smaller Delphin II (which was plagued by problems because its pilot had to stick his head out to see where the plane was going!). The 41-foot-long Delphin III was a civilian transport that could carry six passengers. Its wingspan measured 63 feet, 4 inches; its maximum speed was 93mph; and its cruising speed was 75mph. It was equipped with a 180hp, water-cooled, in-line BMW six-cylinder engine, but it could also be fitted with a Rolls-Royce Eagle or a 400hp Liberty. For takeoffs and landings on ice, the Delphin III's fuselage had steel runners on its bottom.



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 10th of the third month preceding publication (for example, January 10th for the April issue).

CALIFORNIA—Torrance/Gardenia
Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Near LAX.
Owner: John Eaton.
MODEL CENTER
2304 Redondo Beach Blvd. **(213) 327-3862**

FLORIDA—Winter Springs
- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Send $3 for yellow info pack
- Full line of hobby accessories
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.
420 W. S.R. 434 **(407) 327-6353**

ILLINOIS—Chicago
Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.
STANTON HOBBY SHOP, INC.
4734 Milwaukee Ave. **(312) 283-6446**

LATIN AMERICA
COSTA RICA—San Jose
Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.
EL HOBBY SHOP
Centro Commercial, San Jose 2000
Apartado 529, Centro Colon
32-26-81

NEW JERSEY—New Brunswick
R/C Helicopters: Concept, Schluter, Parts & Accessories
R/C Cars, Boats, Parts & Accessories
Customer Support Available
"A Daddy's Toy Store"
HOVER CENTER PLUS, INC.
131 French St. **(908) 937-5828**

NEW YORK—Brooklyn
R/C planes, helicopters, boats and cars.
Huge discounts on all R/C equipment.
Futaba radios at incredible savings!
Special discount for club members!
This is the place!
Open: Mon.-Sat. 10:30-9; Sun. 11-6
HOBBY KING
2720 Avenue U **(718) 648-5399**

OHIO—Findlay
Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.
JINX MODEL SUPPLIES
721 Rockwell Ave. **(419) 422-5589**

OKLAHOMA—Tulsa
R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC.
Hours: Mon.-Sat. 9-7, Thurs.,Till 8.
WINGS 'N THINGS HOBBY SUPPLY, INC.
5241 S. Peoria Ave. **(918) 745-0034**

Send sales message and payment to
Model Airplane News Hobby Shop Directory,
251 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Laura Kidder.

AIRWAVES

(Continued from page 127)

Thanks for the tip, Bill! We called Ira Katz at Tri-Ess and found that they sell colored smoke cartridges that can produce white, red, yellow, green, blue, gray, violet, orange and pink smoke. Ira noted that small, 1/2x1x1/2-inch, cartridges are available for use in model airplanes. These are ignited by nichrome wire that's heated by a 1.5V cell, and the chemicals involved burn at approximately 160 degrees Fahrenheit. This is hot enough to char tissue paper but, according to Ira, not hot enough to ignite it. Ira commented that the smoke cartridges were tested by the U.S. Bureau of Explosives, Edison, NJ, where it was found that the cartridges couldn't be made to start a fire or explode in normal use. According to Ira, the National Institute of Health, Bethesda, MD, tested the product and found no appreciable toxicity.

The cost?—$5.50 a cartridge. The burn period of the smaller cartridges is approximately 20 seconds; larger cartridges with custom colors or longer burn rates are also available.

Note, though, that Section 8 of the AMA Safety Code (included in the AMA Membership Manual) prohibits operation of pyrotechnics ("any device that explodes, burns or propels a projectile of any kind"), including smoke bombs. Exceptions to the code are "rockets flown in accordance with the Safety Code of the National Association of Rocketry, or those permanently attached [as per JATO use]; also those items authorized for air show team use as defined by the AST Advisory Committee (document available from the AMA HQ)." I was unable to get a clarification on whether the AST Advisory Committee has approved or considered the Tri-Ess product, so interested readers

(Continued on page 136)

AIRWAVES

(Continued from page 135)

may wish to inquire with the AMA.

Have any readers devised a safe, hassle-free chemical admixture for colored smoke? Let us know, and we'll report on it.

Want to know more about Tri-Ess? For $1, Ira will send you a 70-page catalogue of this and other special effects he has developed for the entertainment industry. Ira can be reached at: (818) 247-6910; Fax (818) 848-3521. TA

WHERE IN THE WORLD?

What happened to World Engines?

LEWIS ARTHUR
Lyon's Falls, NY

What was World Engines is now ISC International Trading Co., Ltd., P.O. Box 40116, Indianapolis, IN 46240; (317) 844-1978. TA

ABOUT ENGINES

(Continued from page 113)

happened when modelers tried running Cerrobend-headed Foxes! Duke was not amused.

Anyway, it's good practice to remove the backplate of any new engine and flush it out thoroughly, through every opening, with a pressurized penetrating oil like WD40. That could add years to your new engine's life. *(Continued on page 137)*

ABOUT ENGINES

VOLCANIC VECO

I received a Veco .19 in the mail with a letter from M. L. of CA. He said, "Don't mention my name, but here's a weird one for you. This engine spits sparks!"

The engine looked OK to me and had good compression. I put it on my test stand, and M. L. was right! Fat orange-yellow sparks, one every few seconds, flew out from behind the Veco after it had run for a minute or so. I had never seen anything like that before, and was trying to think up some explanation, when the engine stopped. I gave the prop a flip to see whether something was bound up, and there was no compression at all.

Then the cause became obvious: somebody had installed a paper head gasket in the Veco! The sparks were glowing bits of carbonized fiber! Paper gaskets work well for crankcase covers (I use 'em often), but they can't stand high temperatures. Paper begins to char at 450 degrees Fahrenheit, and most glow engine heads (and all spark-ignition heads) are much hotter than that in use.

I made a new head gasket for the Veco out of thin sheet aluminum, lapped it to the head and sleeve with Comet cleanser and water, then cleaned and re-assembled the engine. No more sparks—and much better performance!

**Here's the address of the company featured in this article:*
***Tetra Lube;** distributed by F.T.I. Corp., 1812 Margaret Ave., Annapolis, MD 21401.* ■

ADVERTISER INDEX

A&S Hobbies 138
Academy of Model Aeronautics 11
Ace R/C 66
Aerocraft 109
Aeroglass R/C Flight Academy 138
Aerotrend 132
Airtronics, Inc. 4
Alberta's Littlest Airport 136
Altech Marketing C2,70
America's Hobby Center 21
AMP Inc. Graphics 137
B&P Associates 82
Bob Holman Plans 108
Bob Violett Models, Inc 9
Boca Bearing Co. 98
Bridi Aircraft Designs, Inc. 137
Byron Originals, Inc. 23,57
Carden Corporation 114
Carlson Engine Imports 134
Chris Murphy Flight Jackets 137
Classified Directory 133
Cleveland Model and Supply Co. 59
Coverite 135
Cox Hobbies 26-27
Danbury Mint 15
Danco Signs 109
Dave Brown Products 102
DGA Designs 87
Dickybird Models 87
Don Smith 106
Du-Bro Products 28
Duck Woods 82
Eastern Tool & Supply 59
Ernst Mfg. 109
Flying Model Warplanes 87
Futaba Industries C3
G.M. Precision Products, Inc 132
Great Planes Models 30
Hel-X Corporation 98
Historic Aviation 7
Hobbico 68
Hobby Dynamics 60
Hobby Lobby International 47, 65
Hobby Shop Directory 135
International Coins & Currency 137
J&K Products 20
K&B Manufacturing, Inc. 109
K&S Engineering 105
Kress Jets, Inc. 127
Kyosho 92
Landing Products 10
Lanier RC 108
Major Decals 138
M.A.N. Back Issues 128-129
M.A.N. Buyers' Mart 115-126
M.A.N. Calendar 79
M.A.N. X-Mas Subscription 35
McDaniel R/C 136
MGA Enterprises 135
Micro Mark 110-111
Midwest Products, Inc. 107
Miniature Aircraft USA 104
Minicraft 127
Model/Tronics 66,114
Officers & Gentlemen 105
Ohio R/C 114
O.S. Engines C4
Pacer Technologies 38
Peck-Polymers 114
Propwash Video Productions 107
Quadrotech 106
Radar Sales 107
R.C. Buyers' Warehouse 91
R/C Products Unlimited 107
R/C Systems 76
Retailer 102
RK Electronics 106
Robart Manufacturing 3
Robbe Model Sport 101
Scratch-Building R/C Airplanes 59
Sermos R/C Snap Connectors 107
Shields Aviation 109
Shop Task 137
Sig Manufacturing 67
Sky Aviation 8
Smithy 134
SR Batteries 114
Stream, Inc 136
Tammart Designs, Inc 90
Tatone, Inc. 66
Technopower II, Inc. 106
Tech Specialties 105
Teleflite Corporation 134
Thorpe Engineering 105
Top Flite Models 62
Top Gun 82
Top Gun Aircraft 132
Tower Hobbies 53,103
U.S. AirCore 18
Vailly Aviation 127
Varsane Products 134
Watkins Aviation, Inc. 138
Williams Brothers, Inc. 108
Windsor Propeller Co. 90,138
Z-Best 102
Zenith Aviation 73